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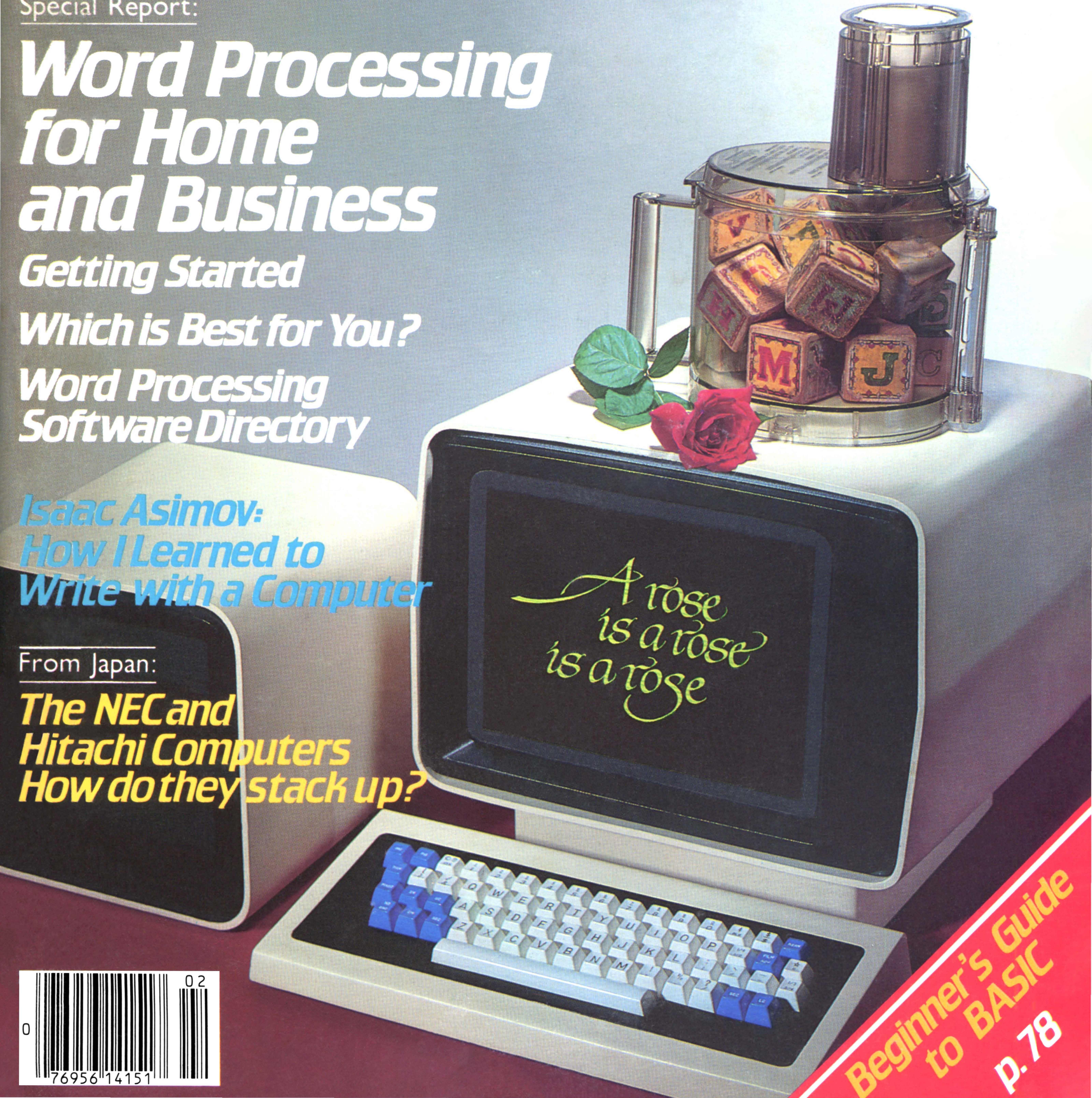
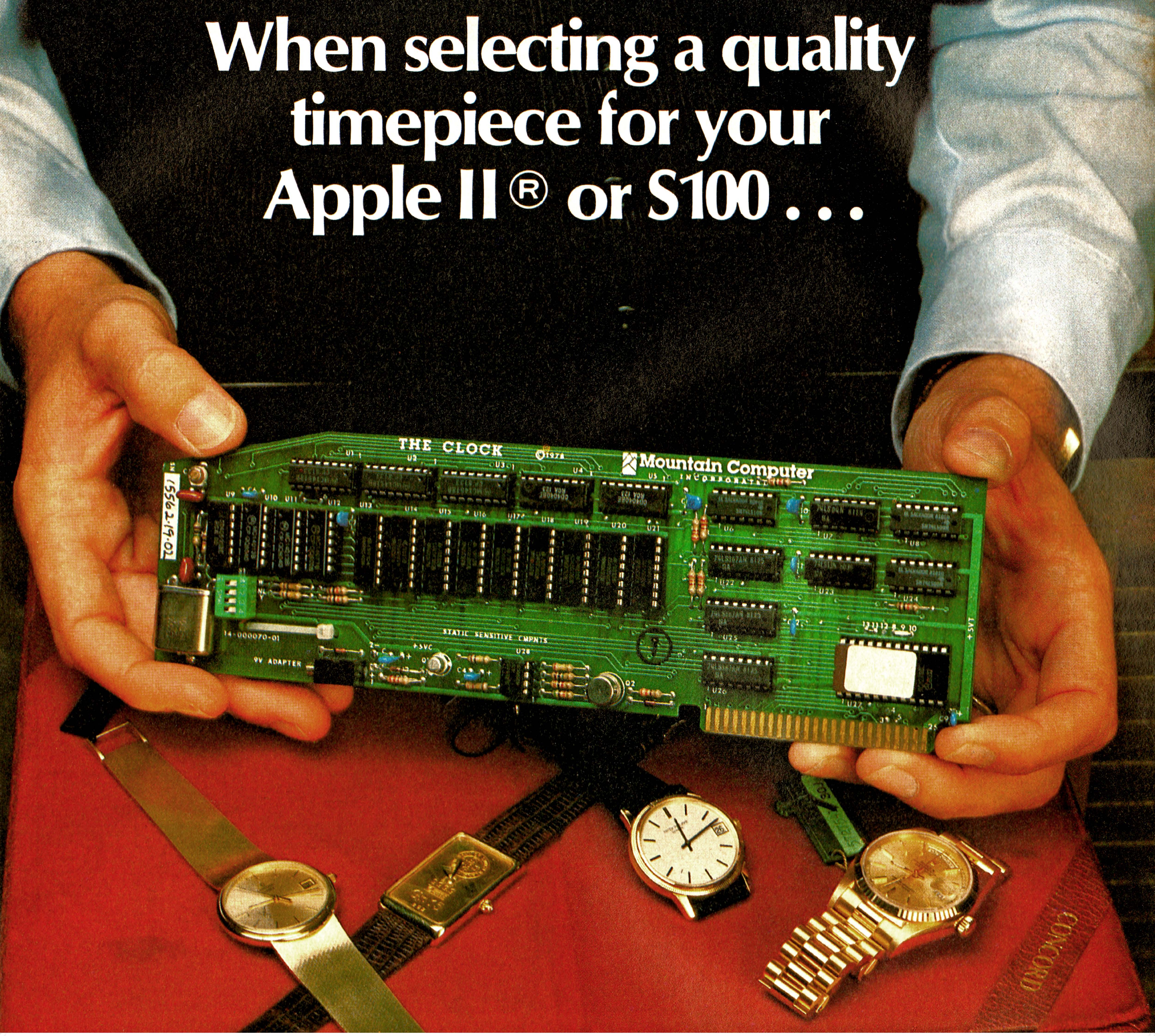


Beginner's Guide to BASIC p. 78



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TABULATE	SORT BY
HELP	SUBTOTALING
GO	ON
READ	FOR
STORE	TOTALS ONLY
USE	PERCENTS
SELECT	ACCUMULATING
RECODE	INCREMENTING
TITLE/SUBTITLE	ON PRINTER

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ENTER		FIND
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Word Processors and Creative Mayhem

In an ever increasing way, communication depends on the printed word. Data processing has spread from its early days as an accounting tool into the heart of the office. Word processing is now elevating written communication to the level of an art form.

—from a paper of the
National Print Quality Seminar

When I first saw this quote reprinted in *The New Yorker*, I chuckled at the unconscious irony of the last line. Then I began to review some writing samples from memos and letters on my desk and stopped short. Some of that prose could have used some "elevating."

Writing is actually a fiction (pun intended). The real "writing" is done in our minds. When we sit down to put one word in front of another—whether with pen, on a typewriter, or word processor—what we really are doing is rewriting the first draft. And then we rewrite. And rewrite. Ideally. But who has the time?

Enter the popular computer with its fast and flexible word-processing programs. So armed, we can attack writing with impunity, commit creative mayhem on manuscripts, turn them upside down, and shake them into literacy. In seconds, we can swap a paragraph here, erase a word there.

Electronic aids to creativity need not be limited to writing. Imagine what da Vinci could have done with a machine capable of erasing or rearranging parts of his paintings. (Such a machine might not be too far in the future.)

I know several writers, Isaac Asimov included (see his article on page 32), who bolted at the thought of feeding prose into a computer's memory—at first. Entire ranks of curmudgeonly reporters who vowed never to relinquish their manual typewriters now routinely prepare copy on computer terminals.

Word processors offer a battery of useful features. Organization is one. I tend to write on small scraps of paper, which get lost easily. Now I transfer my random notes directly to the computer's memory, where they remain until I call them up. And space isn't much of a problem. In fact, an entire book can be stored on a handful of floppy disks.

Speaking of unconscious irony, I'm writing this editorial on a yellow legal pad on board a plane. With the exception of Sony's typecorder (which I haven't had a chance to review), no portable word processors are available today. But *someday* I'll be able to write the Great American Novel at the bottom of the Grand Canyon, without my yellow pad.

Chris Morgan
Editor in Chief

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Ask Popular

Ask Popular is a monthly column in which we answer general questions about small computers. Send questions to: Ask Popular, POB 397, Hancock, NH 03449.

Q What is timesharing? How does it work?

A When many people use a central computer at the same time, and each gets the impression of being alone in using the system, that's timesharing. Universities, information services (such as The Source and CompuServe), and corporations use timesharing to allow many people to take advantage of the resources of a large mainframe computer. Each user needs only a terminal or microcomputer and a telephone modem or other means of connection to the central computer.

Speed and plenty of storage make timesharing possible. The mainframe computer allocates a specific storage area for each user's "work space"—space no other user can modify. The computer serves each user's requests much as a waiter serves many tables at a restaurant. Except this waiter is so efficient that you never notice the time he's away taking care of the other customers.

Q What are the differences among the microprocessors used in personal computers?

A Unless you're an advanced programmer or electronics hobbyist, few of the differences in microprocessors need concern you. The programs you'll be using are designed to insulate you from the details of the microprocessor and to provide you with a convenient working environment. Because one microprocessor offers a richer set of arithmetic instructions, it doesn't mean you'll notice any significant difference when using the BASIC language for that computer (arithmetic might be faster, that's all).

One difference that could be important is the microprocessor's word length. This refers to the number of bits that can be handled as a unit of information or a memory address. Most personal computers handle 8-bit data. The new IBM personal computer can handle 16-bit data, which means faster operation and a larger internal memory capacity. However, even here your program may serve to mask the differences between 8- and 16-bit computers.

Q What are high-resolution graphics?

A Unfortunately, "high resolution" is used rather loosely in the personal computer field. There is no "minimum standard" for high resolution. So we'll just jump in and define one.

In personal computers, graphics displays are composed of dots even when they look like curves, straight lines, or bars. The smaller the dots, the more detailed the images can be.

To test the graphics resolution of a given computer, see how well it draws a circle. If the result looks circular and not "staggered," that's sufficiently high by our sights. For a more objective criterion, a high-resolution display should be able to show at least 128 dots horizontally and 96 dots vertically (128 by 96). Many computers do much better—up to 320 by 200.

High resolution used to be expensive. It's now available on the two least-expensive personal computers—the Radio Shack Color Computer and the Commodore VIC-20.

Q What benefits are there in joining a computer club?

A Computer clubs offer a means of getting together with other folks who have the same interests. As the personal computer industry has grown, so have the computer clubs. Along the way, the profile of their membership has changed. In the ancient days of the computer industry (two to three years ago), computer club members were mainly engineers and hobbyists who banded together to talk jargon and exchange arcane information. But now, you're likely to find all levels of interest. To find out if there's a computer club in your area, call your local computer store.

Q What's the difference between "internal" and "external" memory?

A Internal memory is immediately available to your computer's brain—its microprocessor. Using its own built-in instructions, the microprocessor can retrieve data from and store data in any single location in internal memory without the need to activate any input or output devices. In personal computers internal memory is the semiconductor type, either programmable (RAM) or preprogrammed (ROM). External memory is any form of storage not immediately addressable; it requires complex input/output software to store or retrieve data. Magnetic hard disks, floppy disks, and tapes are examples. Unlike internal RAM, external memory is nonvolatile (permanent unless *you* change it).

Internal memory allows faster access, but is also more expensive than external memory in terms of cost per byte. How much of each do you need? The more external, the better; get just enough internal memory (RAM) to run the specific programs you'll be using.

Q I'm confused about the many versions of the BASIC language. Is there a standard one?

A The microcomputer field has moved so fast technologically that there has been little possibility of

Continued on page 10

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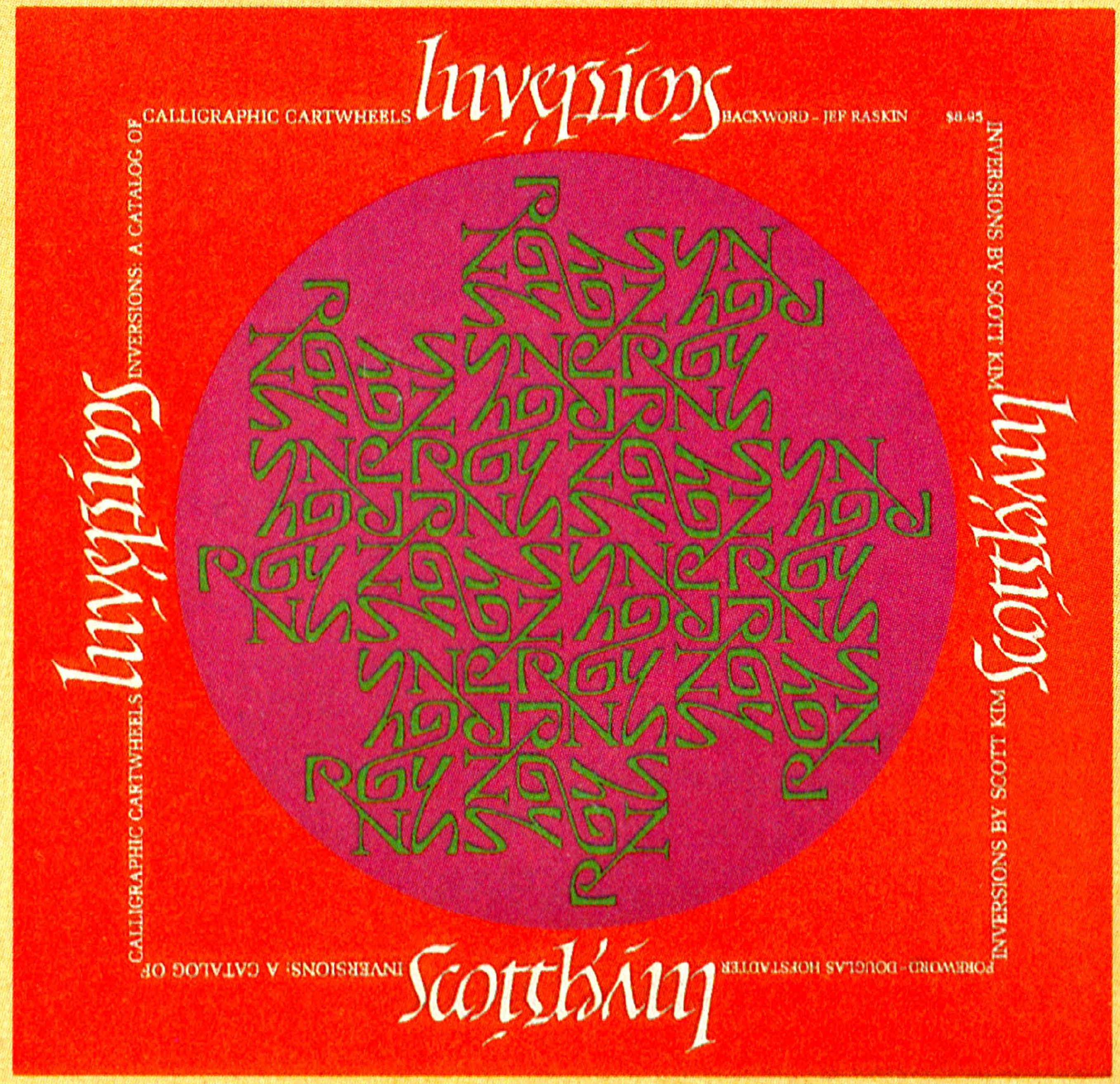

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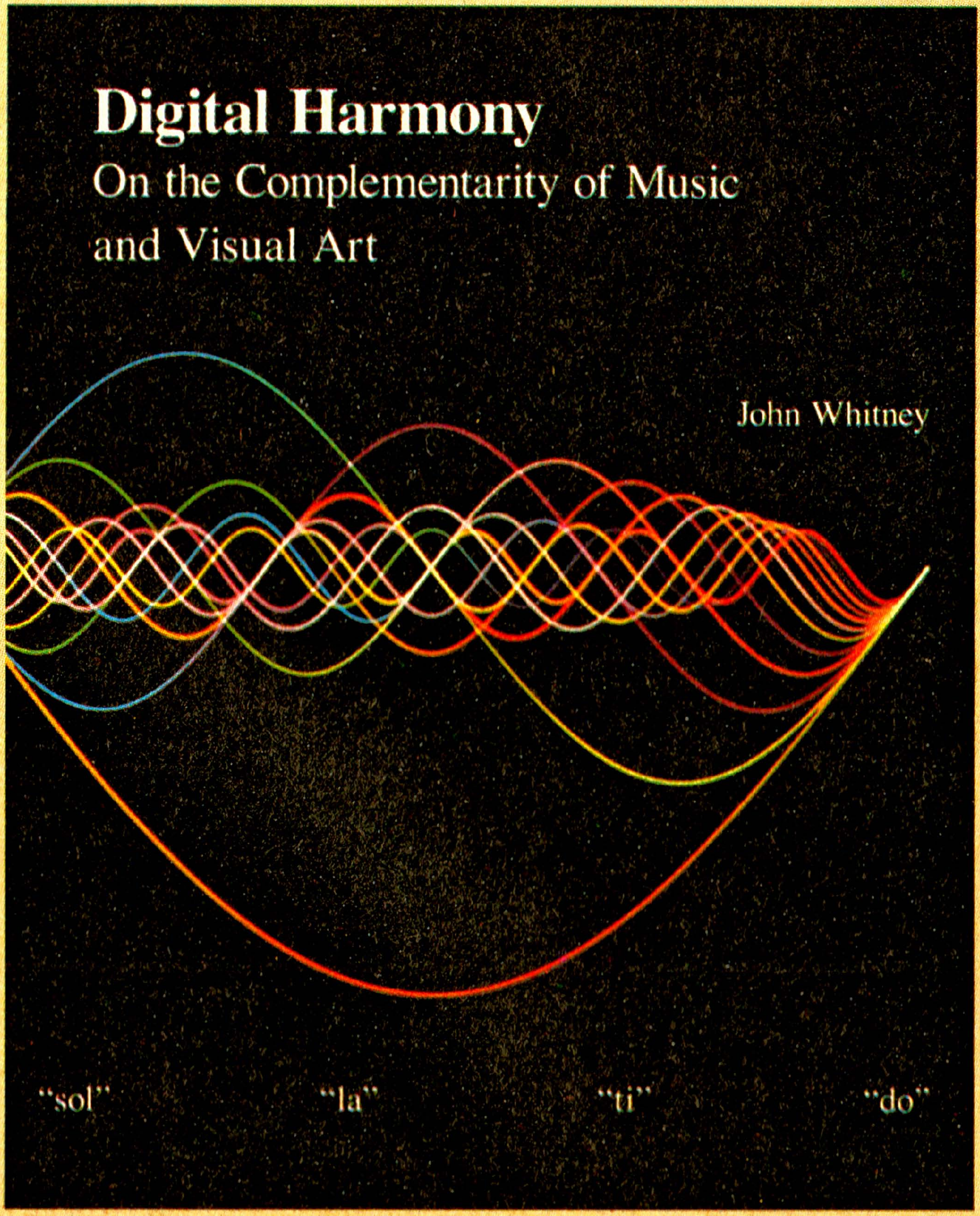

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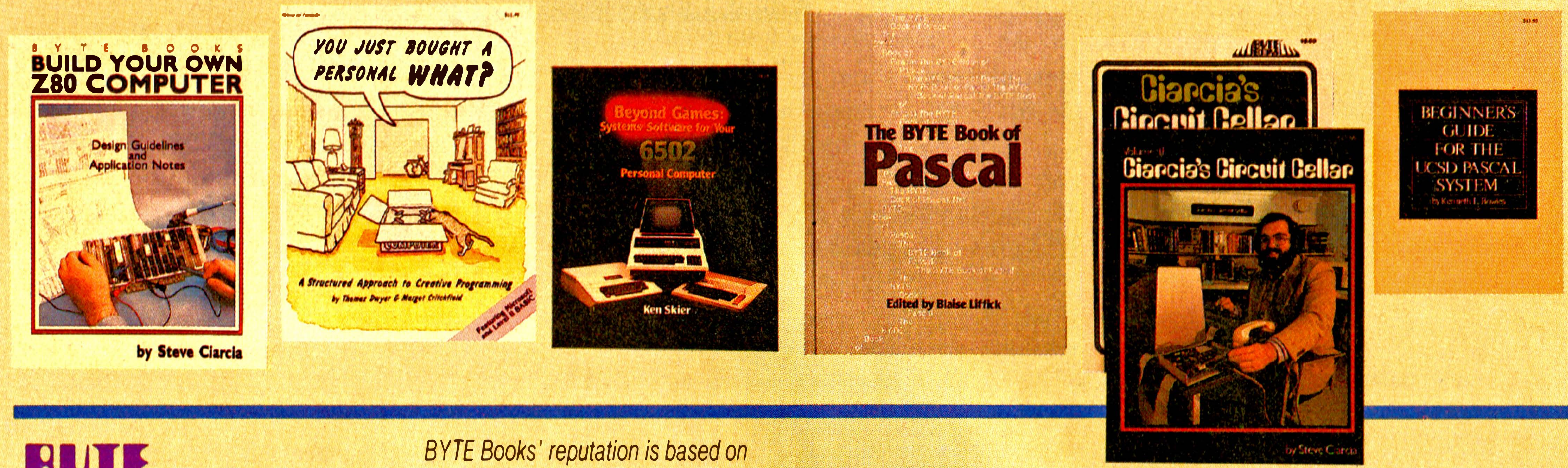

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formal standardization in programming languages. This is particularly true of BASIC, the most common language built into personal computers. There is some *informal* standardization, however. Microsoft BASIC is used on so many personal computers that people treat it as a standard, although there is no guarantee that a BASIC program can be "transported" from one computer model to another even if both use Microsoft BASIC.

There *is* a formal standard for minimal BASIC published by the American National Standards Institute (ANSI) in 1978. The language it describes, however, is so limited in terms of today's capabilities that no manufacturer would consider using it as a product specification. ANSI is now at work on a much more ambitious standard for BASIC—one that will suggest entirely *new* features for the language. Scheduled to be published as a draft in 1982, this standard has a greater likelihood of being accepted.

There are also formal ANSI standards for mainframe computer languages such as COBOL and FORTRAN. ANSI standard versions of these languages are available for many personal computers.

Q **What's a bootstrap?**

A Like its namesake, a computer bootstrap program places a computer in a state of readiness. When a computer is turned on, electronic switches force the microprocessor to start running a bootstrap program stored in ROM. This program may be very primitive, causing the computer to read in a more elaborate program from a disk drive. Alternatively, the bootstrap program may be part of a large ROM-based program such as a BASIC language interpreter. At any rate, by the time the bootstrap program has done its job, the computer is ready to begin some useful work. □

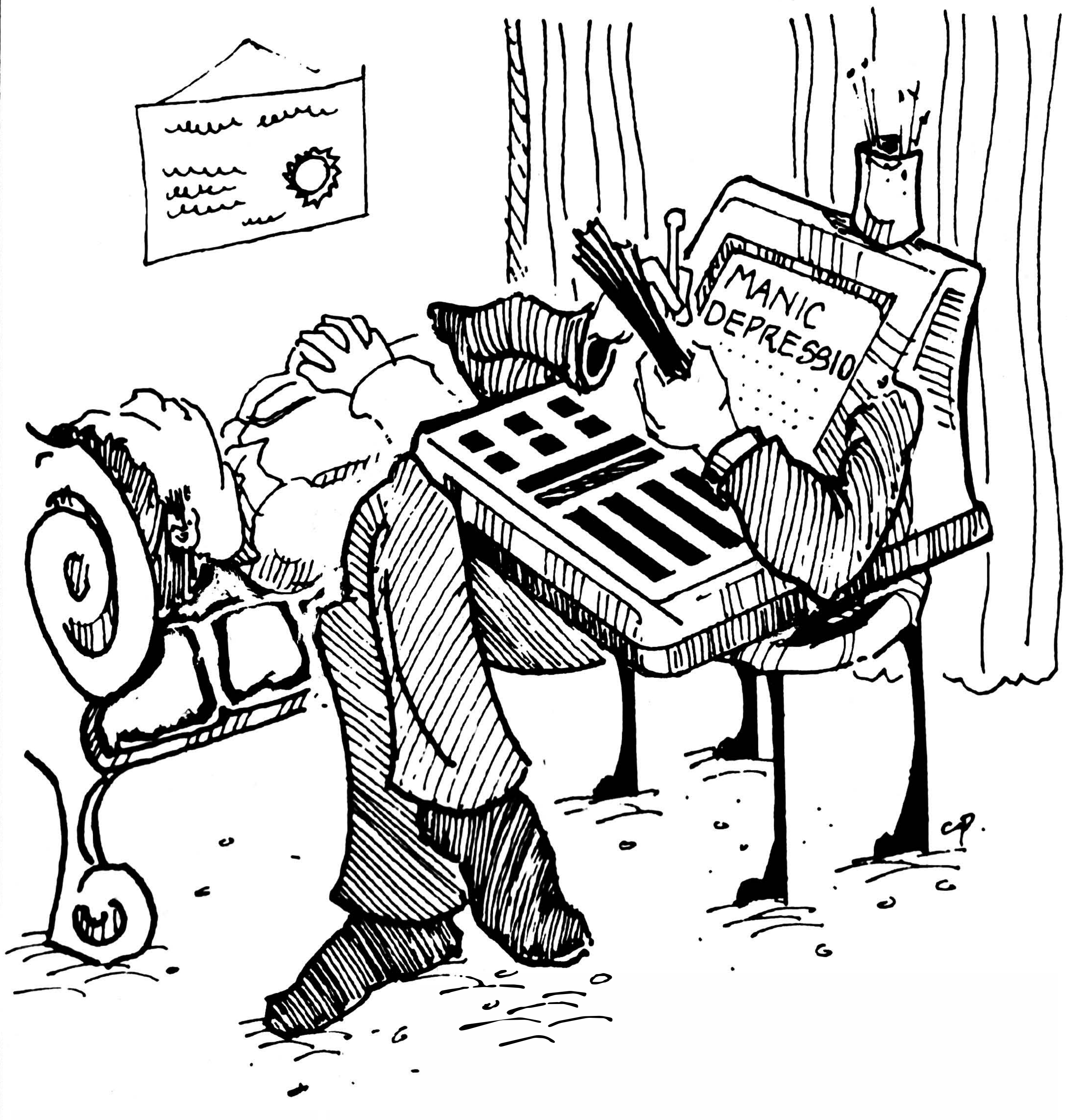
Computerize Your Exercise

Ever wonder how your ideal golf and tennis swings, running stride, and swimming strokes should feel? Do you have trouble deciding when enough's enough, that you really shouldn't play just one more? Exactly what kind of exercise program is best for you?

Dr. Robert Arnot, a Boston sports-medicine specialist, has developed a system to answer your questions by means of instantaneous, body-function feedback. As director of sports medicine at the 1980 Winter Olympics, Dr. Arnot established a computerized lab designed to teach athletes more efficient and effective training methods based on biofeedback. He now wants to develop inexpensive, microprocessor-based devices for use in corporate exercise facilities, hospitals, and doctors' offices.

"Computerized feedback allows an individual to determine whether he is over- or underdoing an exercise and what kind of workout is called for the next day," says Dr. Arnot. "Anything less is like taking a Ferrari to Le Mans without a mechanic. If your manifold is off, you ought to know."

A recent National Science Foundation report predicts that "within ten years, the microhealth industry will virtually explode with amazing new technologies." Dr. Arnot has already come up with an amazing application: a tennis racquet with a built-in microprocessor and strain gauge to minimize injury. Too much spin, hitting the ball too far forward or back, and improper use of arm muscles will register on the racquet. Electronic feedback from the racquet could improve the player's game as well as reduce injury.



Dr. TRS-80 Will See You Now

A Temple, Texas, mental health center has taken medical information management from the couch to the computer. Referring to American Psychiatric Association standards and the individual's case history, a TRS-80 recommends type of treatment, then predicts its duration and cost. Counselors can later consult with the computer for on-going evaluation of the treatment's effectiveness.

The program's designer, William Dossett, says he developed the idea while working on the Community Mental Health Center's accounting and payroll program package. He contends that the computer not only helps the staff by reducing paperwork (a hard copy is produced for client files) but also helps clients, who are guaranteed consistent treatment.

In fact, if all mental health centers were computerized, says Dossett, there might be some semblance of uniformity in diagnosis. He adds, "As it stands, someone can be called manic depressive at one clinic and schizophrenic at another."

California Passes Tougher High-Tech Crime Laws

Reacting to the rise in high-technology thefts, the California state legislature recently passed a law that classifies such crimes as felonies. Under the new law, persons who knowingly buy, sell, or receive stolen semiconductor devices valued at more than $400 will be prosecuted as felons. Crimes involving goods worth less than $400 remain misdemeanors.

New Horizons for Word Processors

Popular computer manufacturers have a standard pitch to businessmen considering buying a dedicated word-processing system: "Why buy a machine that can only do word processing? For the same price or less, you can buy a computer that performs many functions—general payroll, accounting, data communications—as well as word processing."

Now word-processor manufacturers have an answer: their machines can act as computers too. Wang Laboratories recently announced it would make the CP/M operating system available for the Wangwriter, a 128 K-byte, floppy-disk word-processor system priced from $6600 up. That means Wangwriter users will be able to take advantage of the myriad applications programs developed to run under CP/M.

Cost-effectiveness of this approach for the small business remains to be seen. Dedicated word-processing systems are typically lacking in the standard interfaces which allow connection of the units to customer-provided printers, modems, etc. Furthermore, much of the extra cost of a word-processing system goes into special hardware designs for that particular application; for general computing, those special designs may become needless overhead.

Other dedicated machines are getting into the act. Compugraphics Corporation recently announced a new phototypesetting system that can run CP/M, thus becoming a general-purpose office work station.

Filmless Cameras

By merging microprocessor technology and a charge-coupled device (CCD), Japan's Sony Corporation has developed a filmless camera that the company predicts will be marketable by next year.

The new Mavica (for magnetic video camera) resembles a traditional 35mm single-lens reflex camera. Instead of using film that requires chemical processing, though, the Mavica records images on a disk. Photographers insert the disks into a special attachment on their television sets, and images appear on the screen.

The filmless camera works much like other cameras. Light patterns come through the lens, but instead of being recorded on film, they are flashed onto the CCD grid, where they are converted into electrical impulses. These impulses move across the grid until they reach the end. There they are recorded magnetically onto the disk according to light levels, size, and position.

While the pictures won't be as clear or vivid as those produced by typical film (at least for a while), there are definite advantages to shooting with the filmless camera. Disks are expected to retail for about $3 and, like cassette tapes, can be erased and reused. The camera itself will probably sell for $900.

The 7-Second Computerized Sub

Hold the mayo and everything else. The next time you sail into a submarine sandwich shop, you might be making the sub yourself—with the aid of a computer.

Three engineers have developed a computer capable of producing a custom-made sub in seven seconds. All the customer does is press a selection of buttons, and the machine automatically heaps cold cuts, cheese, lettuce, oil, or any combination thereof on an open roll.

Compuserve 2000 took Tewksbury, Massachusetts, inventors Robert Hanson, Edward Lewis, and Donald Olson 15 months and $5,000 to develop. Hanson came up with the idea when he realized that sub shops just don't cut the mustard in the speed department. Consequently, they have trouble competing with Burger Doodle and the like.

Franchisers will be able to buy a similar system for about $20,000.

Computer Firms Flock to Colorado

The booming electronics job market is not confined to Northern California's Silicon Valley or Massachusetts' famed Route 128. In increasing numbers, computer-school graduates are heading for scenic Colorado, where electronic firms are opening dozens of plants between the Rocky Mounains and the state's white-water rapids.

According to an American Electronics Association (AEA) study, the number of computer jobs in the Rocky Mountain State will increase at an average rate of 24.4 percent through 1985. The AEA pegs job growth in Massachusetts and California at 18.7 and 14.8 percent, respectively.

Computer companies expect to draw skilled personnel from both the east and west coasts. Executives at United Technologies Corporation and Inmos Corporation say Colorado is the perfect place for attracting good people. Besides Inmos and United Technologies, such companies as Honeywell, Texas Instruments, and IBM have formed electronics communities. The greatest activity is in the Colorado Springs and Boulder areas.

Colorado, however, has not encouraged rapid industrial growth. For years, the state limited business expansion to preserve its pristine environment. Even when it finally opened its doors to the virtually pollution-free electronics industry, the state government set aside approximately 10,300 acres of so-called green-belt territory to protect wilderness areas.

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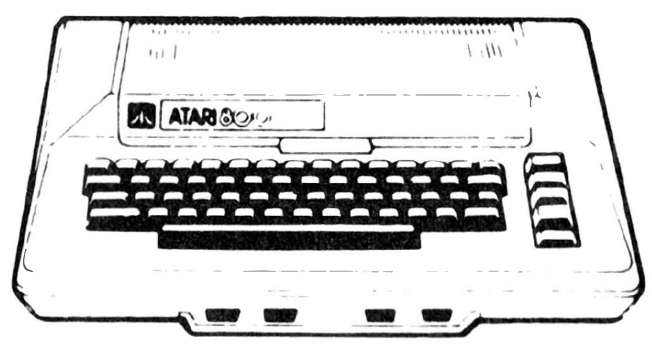

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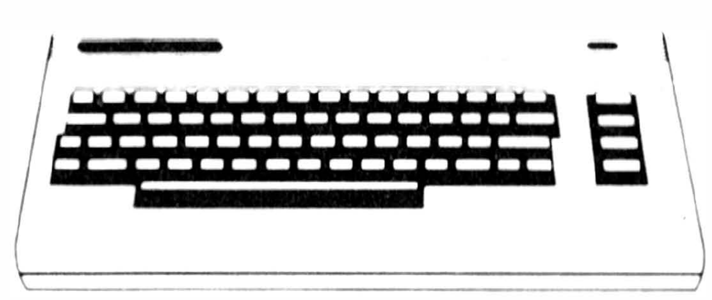

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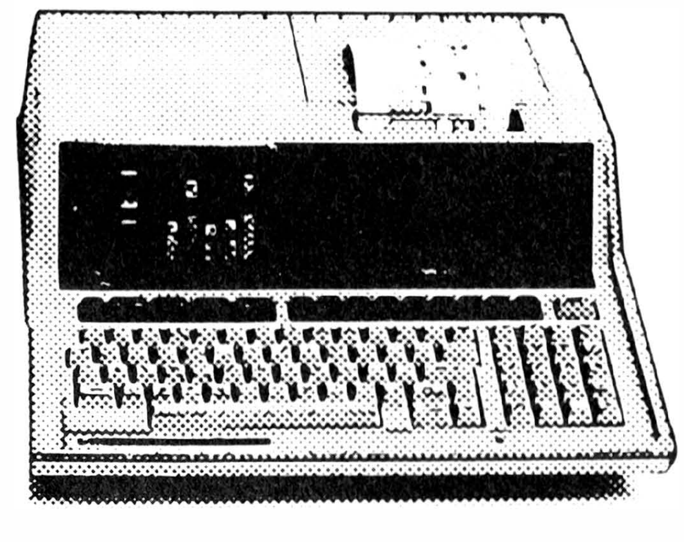

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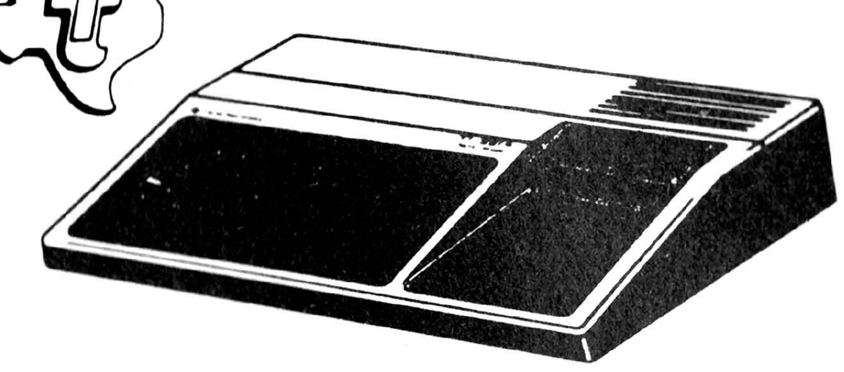

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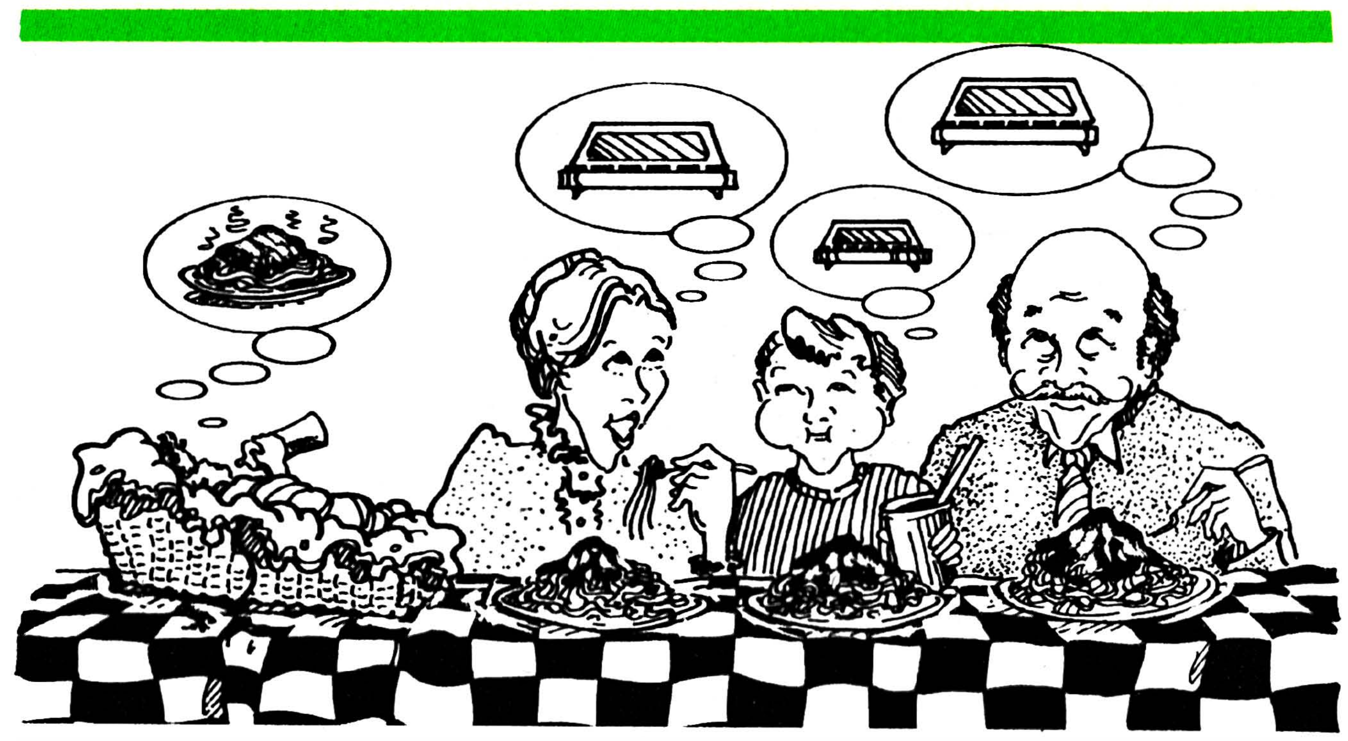

Working for Apples

Elementary school students in Beaverton, Oregon, have done everything from selling begonia bulbs to sponsoring Friday-night spaghetti feeds to pay for their Apples.

Although the school district, third largest in the state, had purchased computers for junior and senior high school students, it hadn't been able to afford microcomputers for the younger children. Enter the parents.

Not long ago, a delegation of parents visited one of the elementary school principals to assess the school's computer education program. Dismayed that nothing was being done, parents began lending their home computers to the school.

While the district has had time-shared computers for 15 years, it has offered widespread computer training to students only since personal computers became relatively inexpensive. In the past three years, the district has spent $120,000 for 60 microcomputers. To provide software for those computers, the district now has a central lending library of 150 programs.

Future plans include linking the three high schools with an educational telecommunications network. But for the elementary students, bake sales and spaghetti dinners will continue to play an important role in the Beaverton educational process.

Firms Test-Market Home Computer Services

While you may still be deciding whether or not to buy a home computer, private enterprise is test-marketing ways to deliver the computer age to your doorstep.

AT&T and CBS have jointly planned a seven-month teletex test that will give 200 Ridgewood, New Jersey, households cost-free access to equipment and database news, sports, weather, entertainment, and shopping information. Two types of home terminals for accessing data from a DEC PDP 11/70 will be tested with transmission over Bell System's telephone lines (the mainframe computer will be housed at a local phone company).

American Express currently is test-marketing the Sinclair ZX81, which retails for $149.95. Industry analysts predict its linkup with American Express processing centers for purchase of traveler's checks, catalog items, database subscriptions, and other American Express services. If the test proves successful, American Express plans to begin full-scale marketing of the ZX81 later this year. □

This month Popular Computing *focuses on word processing for small computers (as opposed to dedicated word processors—customized computers whose only function is word processing). With the right software, any personal computer can become a word processor.*

Peter McWilliams kicks off our look at "word crunching" with an introduction to basic facts, features, and terms. We follow that with an extensive chart, compiled by Phillip Good, which gives a feature-by-feature comparison of word-processing software for small computers.

Also be sure to read Isaac Asimov's "The Word Processor and I." (When Popular Computing *heard that Dr. Asimov was still writing on a typewriter, we arranged for him to try out a word processor—his life hasn't been the same since.)*

Completing our overview is McWilliams' light-hearted essay on writing poetry with a word processor. Now, on to the ABCs . . .

An Introduction to Word Processing

How to tell a wild card from a word wrap:
a glossary of features and benefits.

by Peter McWilliams

Word processors eliminate the big question all writers face: "Is this change worth retyping the page?" Now wordsmiths can take words out, put words in, correct spelling, and add pages of information at any time in the writing process—sans scissors, erasers, glue pots, or tape. Word-processing text adjusts accordingly, automatically, electronically. Change is easy because it's done with electrons and electrons love to change.

When computers were first built, they were designed for one purpose only, to perform complex mathematical calculations incredibly fast. But as computer technology advanced, designers realized that the machine's fantastic ability to "crunch numbers" could be used for other things—to "crunch words," for example.

What is word processing? At its most basic level, it's still a mathematical process because computers work with the ones and zeros of binary code. But that math is, in the parlance of computer people, *user transparent*.

All you see—or need to see—are words on the video screen. A word processor allows you to make corrections, move paragraphs around, or personalize a form letter. The proverbial harried novelist filling a wastepaper basket with half-empty sheets and the busy secretary continually retyping a letter are on their way out. With a word processor you can rework your writing until it's perfect and then print it out.

Even if a document has been printed, making changes on the video screen and then reprinting the new version require only minimal time and effort. In fact, working copies can be printed at any time with the push of a few buttons.

But beyond the simple convenience and ease of a word processor, the bottom line in word processing is productivity—that's why word processors are carving a giant niche in business, industry, and writers' hearts.

What follows is a guide to some of the most useful word-processing features.

Basic Tools

FILE LENGTH determines the amount of text the word-processing file can contain. This is usually measured in *kilobytes* (K), each one equaling 1024 bytes. Any letter, number, character, or space is a byte. Twenty K would be 20,480 bytes, 240 K would be 245,760 bytes. (For a familiar reference, a double-spaced, typewritten, 8½-by-11-inch sheet of paper with generous margins contains about 2000 bytes, or 2 K.)

Some of the less expensive word-processing programs handle only one or two pages of text at a time. With other, more expensive systems, document length is limited only by the capacity of the storage disks used—and that may range from 70,000 to over 400,000 characters.

WORD WRAP means that when you reach the end of a line during text entry, the next word automatically begins on the next line. If you're used to a typewriter, your hand may be conditioned to reach for the carriage return at the end of each line, but once you've adjusted to word wrap, it's heaven. No more listening for the bell, no more wondering if the next word will fit, no more margin releases. Just type, type, type. The only time you'll use the carriage return is to begin a new paragraph or to end the line before the right margin (for list making or poetry writing).

FILE INSERTION allows you to add the contents of files B, C, and D to file A, just by pushing a few buttons. Each disk has many files, ranging in length from one letter to the maximum permitted by the word-processing program. Using file insertion you can create files of frequently used paragraphs or phrases and add them to letters or contracts in seconds. My name and address are in a file marked AD, and my name, address, and phone number in a file marked ADP. When I come to the end of a piece of correspondence, I type two letters—a code to tell the computer that I want to place a file into my text—and then I type AD (or ADP).

BLOCK MOVE. If you've ever written a paragraph and then wished it could go into another part of the document, you will appreciate block moves. Simply mark the beginning and ending of the block of text, move the cursor to where you'd like that block to go, and instantly it is moved to its new neighborhood.

Many systems will also let you copy a block of text. The original block stays where it is, and an identical copy is written into another part of the document. You can also move or copy a block into another file. Suppose you discover a paragraph that you want to use again in other documents: you can copy it into a new file, name it, and move on. The next time you need that paragraph, use file insertion to move it into the text.

GLOBAL SEARCH will find anything at any point in your document. For example, if you have a long document and you want to return to the section in which you were rhapsodizing about clouds, type "clouds" into global search and the computer will find and display the first time the word occurred. Push a button and the computer moves to the next point where "clouds" appeared, and so on.

SEARCH AND REPLACE not only finds any word or character in the document, it also changes the word or character to any other word or character. If you write a letter to Michael and use his name throughout, and then decide you want to send the same letter to Mary, the computer will find each reference to "Michael" and change it to "Mary."

Search and replace also saves on typing. Suppose you're writing a lengthy report on the heterobasidiomycetes (a subclass of fungi, for the two or three out there who didn't know). Your report would mention the word heterobasidiomycetes quite a few times. You might soon tire of typing out heterobasidiomycetes. You might, in fact, find yourself avoiding it altogether. But with search and replace, you can use a symbol, say "@", each time you want to insert heterobasidiomycetes. Search and replace substitutes all occurrences of "@" with "that word." Your report, your fingers, and your sanity are all saved.

DICTIONARY (also known as **Proofreader** or **Spell Check**) is one of my favorite features. It checks every word in your document against a list of correctly spelled words. These lists range from 10,000 to 45,000 words. If a word in your document does not match a word in the list, the word is either misspelled or it does not appear in the program's list of words.

The dictionary feature then lists unmatched words. If they are spelled correctly, they can be added to the dictionary so that future checks will include that word. If they are incorrect, they are automatically marked in the text and found using global search. A " * ", for example, is placed before each misspelled word. Global search finds all incidences of the symbol " * " and, one by one, the misspelled words are presented for correction.

This feature isn't usually included as part of word-processing programs but is available as a separate program for use with whatever word-processing software you own. The best dictionary programs can find the correct spelling of a word even if you incorrectly guess at the spelling.

CENTERING automatically centers any word or group of words between the left and right margins. It's great for headings, titles, addresses, invitations, poetry, and the like.

PAGE DISPLAY shows you where page breaks will occur when the document is printed, which helps avoid beginning a new page with the last three words of a paragraph.

AUTOMATIC PAGINATION automatically prints page numbers at the bottom, top, left, or right side of each page. Like most features, it can be switched off so that no page numbers appear.

SCREEN-ORIENTED programs display on the video screen exactly what you'll get on the printed page. If you want right-justified margins, they are displayed that way on the screen. If you make a change, it is instantly reflected on the screen. (**Character-oriented** word-processing programs display the words in the order, but not necessarily the format, in which they will be printed. Some people don't

mind this; others want to see what they're working on in the form in which it will be printed.)

JUSTIFICATION is *not* a list of reasons why you spent so much money on a fancy typewriter. It means that the right margin is straight and even, just like the left. The printed copy resembles that of most books, newspapers, and magazines. It is accomplished by adding space and expanding shorter lines. The less-sophisticated way to add spaces is to put them between words. Sometimes it looks OK, and sometimes it   looks   like   this. The classy, Beverly Hills method, *microspacing*, adds teeny-tiny spaces between each letter. (Justification can be turned off so that an intimate letter won't look as if it came from a computer.)

PROPORTIONAL SPACING means that the space occupied by a character is proportional to the shape of that character. This contrasts with *monospacing*, which gives each character an identical space regardless of the character's shape. For example, in proportional spacing the letter "i" occupies much less space than the letter "M." The type in this magazine is proportionally spaced.

Many of the recent daisy-wheel and dot-matrix printers offer proportional spacing as an option; however, not all word processors support this feature.

Further Enhancements

While on the subject of printers, let's discuss some of the printing enhancements that are available when a first-rate printer and word-processing program are combined.

DOUBLE STRIKE types each character twice, which gives a darker, more solid impression. It is useful for preparing copy that will be printed.

BOLDFACE types each character twice, too, but the second impression is slightly to one side of the first. The two impressions overlap to form a dark, solid character.

PITCH refers to the number of characters per inch. We're most accustomed to pica (10 characters per inch) and elite (12 characters). Better programs and printers allow you to change pitch at any point without interrupting printing. One system prints as few as 4 characters per inch and as many as 30.

OVERPRINTING allows you to print one character over another. It's valuable for foreign languages (when you want to accent a word, as in "olé") or if you want to create your own characters, as someone did when he combined the "?" with the "!" and came up with "‽"; it's called an interrobang and it's used to punctuate sentences such as "You're what‽" or "You're going where‽"

More Terms

Other word-processing terms you may hear less frequently are:

KEYPHRASE, which is a single-key abbreviation for often-used phrases. This feature works like block moves, but it involves phrases or sentences instead of paragraphs.

TYPEOVER is the ability to replace text simply and quickly by typing new information "over" the old.

INTERMEDIATE BUFFER saves the original text until you command the system to implement your changes.

A **WILD CARD** allows you to search for text strings in which certain parts of the string don't matter. For example, the command "FIND Model*" might tell the computer to search for Model I, Model II, or Model III (the asterisk signifies a wild card).

MAIL MERGE or **FILE MERGE** lets you create form letters. One file contains the base document, the other contains the names to be plugged into specified areas in the base document.

KERNING, a term borrowed from typesetting, is the ability to reduce the amount of space between letters. It tightens the text horizontally.

This list far from exhausts the features available on word-processing programs and more are invented every day. But whatever your word-processing needs, chances are good that a program exists that will make your writing task much easier. □

Los Angeles-based writer Peter McWilliams has written some 20 books, including The Word Processor Book: A Short Course in Computer Literacy, *from which this article was taken.*

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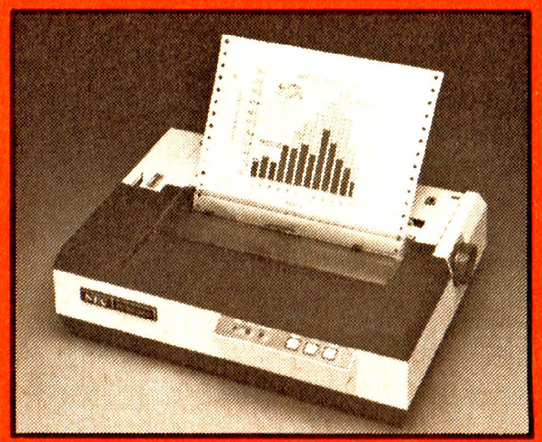

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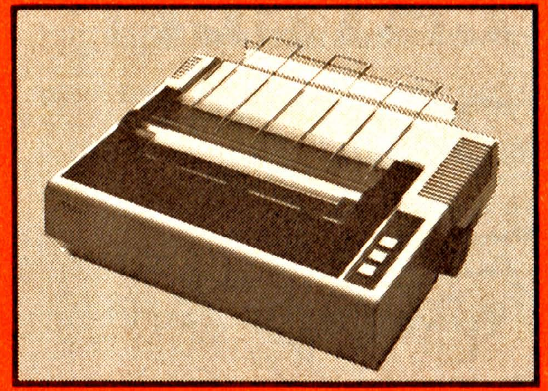

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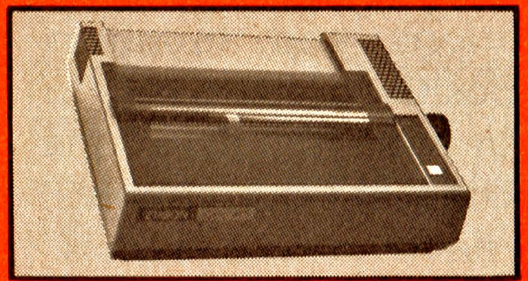

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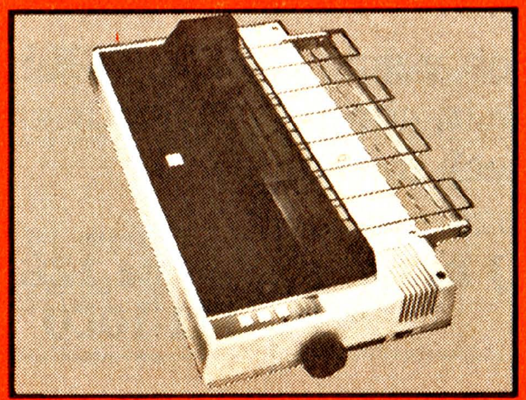

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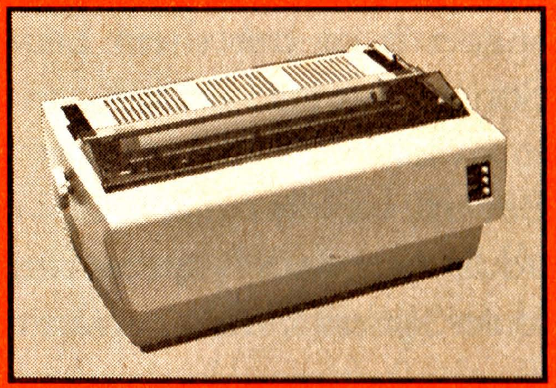

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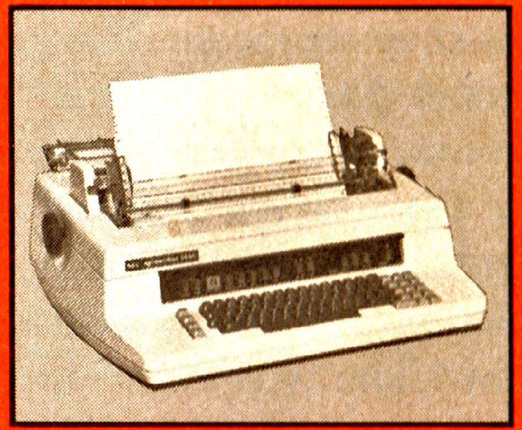

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MALIBU 200 . . . . (List $2995) $ Call

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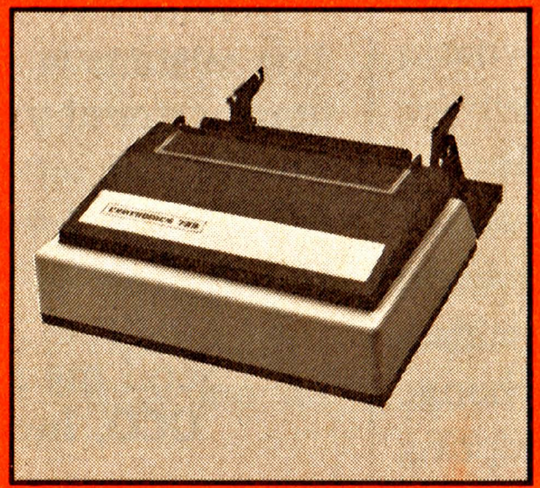
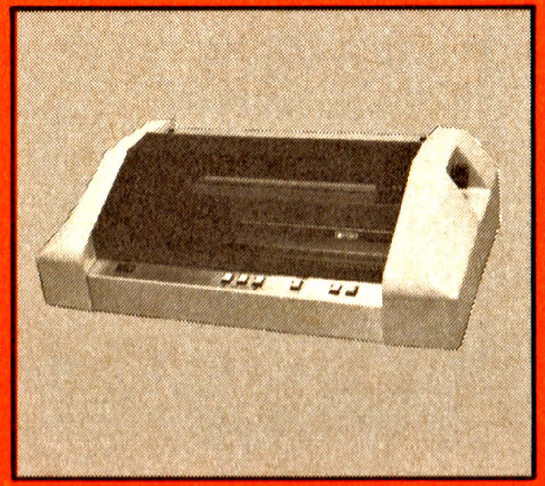
CENTRONICS 739



With graphics and word processing Print Quality · 18 x 9 dot matrix; suitable for word processing · Underlining · proportional spacing · right margin justification · serif typeface · 80/100 CPS · 9½" Pin Feed/Friction feed · Reverse Platen · 80/132 columns · Top of Form

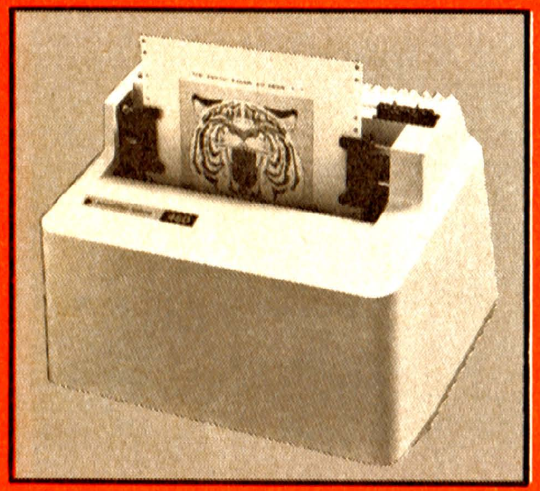
CENTRONICS 739-1 (Parallel) . . . . (List $955) $Call
CENTRONICS 739-3 (Serial) . . . . (List $1045) $815

ANADEX



Dot Graphics, Wide Carriage · 11 x 9 dot matrix; lower case descenders · Dot resolution graphics · Bi-directional, logic seeking · Up to 200 CPS · RS 232 Serial & Parallel · Forms control · X-ON/X-OFF · Up to 6 part copy.
ANADEX 9501 . . . . (List $1650) $1350

IDS PAPER TIGERS



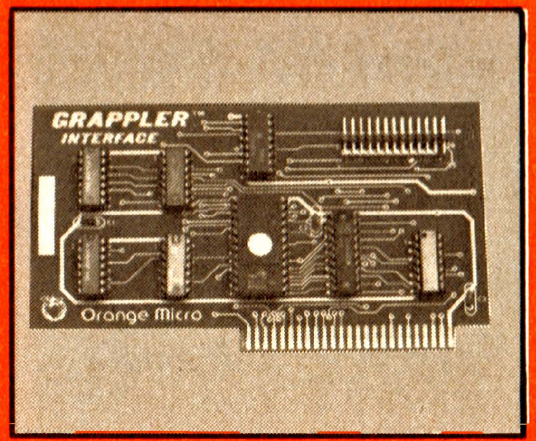
Dot Resolution Graphics, quality print, speed 9 wire staggered printhead with lower case descenders · Over 150 CPS · Bi-directional, logic seeking · 8 character sizes; 80-132 columns · Adjustable tractors · High-resolution dot graphics · Proportional spacing & text justification
IDS 460G . . . . (List $1094) $ Call
IDS 560G . . . . (List $1394) $ Call

INTERFACE EQUIPMENT

CCS APPLE SERIAL Interface & Cable $150
ORANGE INTERFACE for Apple II parallel interface board & cable $110
TRS-80 CABLES to keyboard or Exp. Interface . . . $ Call
NOVATION D-CAT direct connect modem . . . . $ Call
ATARI, NORTHSTAR printer cables . . . . $ Call
ALL EPSON ACCESSORIES . . . . $ Call

THE GRAPPLER™

APPLE INTERFACE AND CABLE by Orange Micro



The Grappler™ interface card is the first to provide on-board firmware for Apple high resolution dot graphics. No longer does the user need to load clumsy software routines to dump screen graphics—it's all in a chip. Actually, it's our E-PROM, and it is replaceable to accommodate the Anadex, Epson MX-70, 80* and 100, IDS Paper Tigers, Centronics 739, NEC 8023, C. ITOH Prowriter, and future graphic printers. The Grappler™ accepts 18 software commands including Hi-Res inverse, 90° rotation, double size, and much more. Invented by, and available from Orange Micro and Orange Micro dealers only. $ Call for price.

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Word-Processing Software Directory

The tables on the following pages summarize the many features of popular word-processing programs for CP/M-based computers, TRS-80s, Apples, and Ataris. The tables are by no means a complete listing of all available products but represent established word-processing products tested by author Phillip Good.

The five tables include:

- CP/M-based and TRS-80 text editors
- CP/M-based and TRS-80 text formatters
- Apple and Atari text editors
- Apple and Atari text formatters
- A list of vendors

In many cases text editors and text formatters are part of the same program. Text editors are tools used to input and modify text; text formatters control the appearance of the text on the printed page.

The features and terms listed in the tables are explained in Peter McWilliams' "Introduction to Word Processing" on page 17.

CP/M-based or TRS-80 Text Editor	Benchmark	Magic Wand	Mince (Scribble)	Scripsit TRS-80 Model II, vers. 2.0	Scripsit TRS-80 Models I/III, vers. 1.0	Select	Spellbinder	Vedit	Wordstar
OVERALL									
years on market	1	3	1	1	3	1	1	2	3
price	$499	$400	$125	$399	$99.95	$595	$495	$130	$445
for all CP/M-based computers	no	yes	yes	non CP/M	non CP/M	yes	yes	yes	yes
menu driven	yes	no	no	yes	no	yes	no	no	yes
displays multiple files	no	no	yes	no	no	no	no	no	no
displays text as it will appear in print	yes	no	no	yes	no	yes	yes	no	yes
prints one file while editing another (spooling)	no	yes	no	yes	no	no	no	no	no
edits programs and text	no	yes	yes	no	yes	no	yes	yes	yes
customized control characters	no	yes	yes	no	no	no	yes	yes	no
handles files larger than memory	no	yes	yes	yes	no	no	yes	yes	yes
DOCUMENTATION									
getting started	easy	easy	slow	slow	slow	best	easy	hard	hard
tutorials	good	excel	vgood	best	good	vgood	good	poor	good
examples	some	many	none	many	yes	none	few	none	some
help menus	many	some	none	yes	no	yes	yes	no	yes
reference material	good	good	good	fair	no	excel	good	fair	excel
reference card	no	yes	no	yes	yes	yes	no	no	yes
FILE CONTROL									
continuous back-up	yes	no	no	by page	no	no	no	no	no
automatic back-up on file save	yes	yes	no	no	no	yes	yes	no	yes
save file and continue editing	no	yes	yes	yes	yes	yes	yes	yes	yes
insert second file	no	no	yes	yes	yes	yes	yes	no	yes
insert portion of second file	yes	yes	yes	no	no	no	no	no	yes
display second file	no	yes	yes	no	no	no	no	no	yes
display file directory	yes	yes	yes	yes	no	yes	yes	no	yes
kill file (and create space)	no	yes	yes	yes	no	yes	yes	no	yes
prepares files for transmission	yes	yes	yes	yes	yes	yes	yes	yes	yes
SCROLLING (cursor movement)									
by word	no	yes	yes	no	no	no	yes	no	yes
by line	no	yes	yes	yes	yes	no	yes	yes	yes
by sentence	no	no	yes	yes	no	no	yes	no	yes
by screen	yes	yes	yes	by page	no	yes	yes	yes	yes
to beginning or end of workspace	yes	yes	yes	yes	yes	no	yes	yes	yes
to beginning or end of document	no	no	yes	yes	yes	no	yes	no	yes
horizontal scroll	no	no	no	yes	yes	no	yes	no	yes
DELETE									
by character	yes	yes	yes	yes	yes	no	yes	no	yes
by word	no	no	yes	yes	yes	no	yes	no	yes
by line	no	yes	yes	no	no	no	no	yes	yes
by sentence	no	no	yes	yes	yes	no	yes	no	no
by screen	no	no	yes	no	no	no	no	no	no
by block	no	yes	yes	yes	yes	yes	yes	no	yes
continuous	yes	no	no	no	no	yes	no	no	no
INSERT									
keyphrases	52	none	none	yes	no	none	none	none	none

CP/M-based or TRS-80 Text Editor	Benchmark	Magic Wand	Mince (Scribble)	Scripsit TRS-80 Model II, vers. 2.0	Scripsit TRS-80 Models I/III, vers. 1.0	Select	Spellbinder	Vedit	Wordstar
typeover	yes	yes	no	yes	yes	yes	yes	no	yes
insert mode	no	yes	no	yes	yes	no	yes	yes	yes
push ahead	no	yes	yes	no	no	no	no	yes	yes
split and glue a line	no	no	no	yes	yes	no	no	no	no
intermediate buffer	no	no	no	no	no	yes	no	no	no
block whole sections	yes	yes	no	yes	yes	yes	no	yes	yes
delete and restore	no	no	yes	no	no	no	yes	no	no
SEARCH									
find phrase anywhere	no	no	no	yes	yes	no	no	yes	yes
find with user replace	yes	no	no	yes	no	yes	yes	no	yes
find and replace n times	no	yes	no	yes	yes	yes	yes	no	yes
find and replace all in document	no	no	no	yes	no	no	no	no	yes
find and replace all in memory	yes	yes	no	yes	yes	yes	yes	no	no
use wild cards	no	no	no	no	yes	no	yes	no	yes
ignore upper/lower case	yes	yes	yes	no	no	no	no	no	yes
SCREEN FORMAT									
format entire text	yes	no	no	yes	yes	yes	yes	no	yes
format different parts	yes	no	no	yes	yes	no	yes	no	yes
set line length	yes	yes	no	yes	yes	yes	yes	no	yes
set tabs with cursor	no	no	no	yes	yes	yes	yes	no	yes
set tabs by command	yes	yes	yes	yes	yes	yes	yes	yes	yes

CP/M-based or TRS-80 Text Formatter	Benchmark	Magic Wand	Mince (Scribble)	Scripsit TRS-80 Model II, vers. 2.0	Scripsit TRS-80 Models I/III, vers. 1.0	Select	Spellbinder	Vedit	Wordstar
OVERALL									
display as printed	yes	yes	yes	yes	no	yes	yes		yes
print one file while editing another	no	yes	no	yes	no	no	no		yes
mail-merge or file-merge	yes	yes	no	yes	no	no	yes		Xtra $
most printers supported	not Qume	almost	not Qume	many	many	almost	yes	none	yes
conditional formats	yes	yes	yes	no	no	no	hard		no
LAYOUT									
from menu	yes	yes	no	yes	no	yes	yes		yes
menu may be skipped	yes	yes	no	yes	no	no	yes		no
under user control	yes	yes	yes	no	no	no	yes		yes
characters per inch	yes	yes	yes	yes	no	yes	yes		yes
lines per inch	yes	yes	yes	yes	yes	no	yes		yes
width limitation	155	none	none	156	132	132	none		none
PAGE CONTROL									
one-line heading	yes	yes	yes	yes	yes	yes	yes		yes
multi-line heading	yes	yes	yes	yes	yes	yes	no		yes
heading and footing	yes	yes	yes	yes	yes	yes	yes		yes
page numbering	yes	yes	yes	yes	yes	yes	yes		yes
odd/even page distinction	yes	no	yes	no	yes	yes	yes		no
conditional new page	no	yes	yes	no	no	no	hard		yes
TEXT CONTROL									
justify	yes	yes	yes	yes	yes	yes	yes		yes

CP/M-based or TRS-80 Text Formatter	Benchmark	Magic Wand	Mince (Scribble)	Scripsit TRS-80 Model II, vers. 2.0	Scripsit TRS-80 Models I/III, vers. 1.0	Select	Spellbinder	Vedit	Wordstar
center	yes	yes	yes	yes	yes	yes	yes		yes
phantom hyphen	no	yes	no	no	yes	no	yes		no
multiple columns	no	yes	no	yes	no	no	yes		yes
reverse line feed	no	yes	no	yes	no	no	no		yes
PRINTER CONTROL									
underline	yes	yes	yes	yes	no	yes	yes		yes
boldface	yes	yes	yes	yes	no	yes	yes		yes
vary boldface intensity	no	yes	yes	no	no	no	yes		yes
super- and subscript	yes	yes	yes	yes	no	yes	yes		yes
change ribbon colors	no	no	no	no	no	no	yes		yes
kerning	no	yes	yes	no	no	no	no		no
change control characters	no	yes	yes	yes	no	no	yes		no
proportional spacing	no	yes	no	no	no	yes	yes		yes
OUTPUT CONTROL									
interrupt, resume	no	yes	yes	yes	no	yes	yes		yes
alter format	no	yes	no	no	no	no	yes		yes
pause for text entry	no	yes	yes	no	no	no	hard		yes
pause for variable entry	no	yes	yes	no	no	no	hard		yes
start/stop as designated	yes	yes	no	yes	yes	yes	yes		yes
print multiple documents	yes	no	yes	no	no	no	yes		no
print multiple copies	no	yes	yes	yes	yes	yes	yes		yes

Apple or Atari Text Editor	Apple Writer	Easy Writer	Letter Perfect	Magic Window	Superscribe II	Super Text	Wordstar
OVERALL					*uses high-res graphics		
years on market	3	2	3	2	1	2	1
price	$75	$129	$150	$100	$130	$100	$375
back-up	one	yes	mail	no	mail	one	yes
upper/lower case	print only	no	yes	yes	yes*	yes	yes
80-column screen	no	no	yes	no	yes*	no	yes
menu driven	no	yes	no	no	yes	no	yes
displays multiple files	no	no	no	no	no	yes	no
displays text as it will appear in print	no	no	no	yes	partial	no	yes
prints one file while editing another	no	no	yes	no	yes	no	slow
edits programs and text	yes	no	no	yes	yes	no	yes
customized control characters	no	no	no	no	yes	no	no
handles files larger than memory	no	no	no	no	yes	yes	yes
DOCUMENTATION							
getting started	slow	vslow	fair	excel	fair	hard	m hard
tutorials	m good	fair	fair	fair	fair	minimal	good
examples	no	no	one	no	some	few	some
help menus	some	yes	no	no	yes	needed	yes
reference material	good	fair	good	fair	fair	poor	excel
reference card	yes	no	yes	yes	yes	yes	yes
FILE CONTROL							
continuous back-up	no	no	no	no	no	no	no

The Manager Series* from Microsoft™ turns a personal computer into an executive toolbox.

Better management tools. The Manager Series from Microsoft turns an inexpensive personal computer into an executive's toolbox. Not a computer programmer's toolbox. An executive toolbox. Computerized management tools for non-computer people.

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Apple or Atari Text Editor	Apple Writer	Easy Writer	Letter Perfect	Magic Window	Superscribe II	Super Text	Wordstar
automatic back-up on file save	no	no	no	no	no	no	yes
save file and continue editing	no	yes	yes	no	no	yes	yes
insert second file	yes	no	yes	yes	no	yes	yes
insert portion of second file	no	no	no	yes	no	no	yes
display second file	no	no	no	no	no	yes	yes
display file directory	yes	yes	yes	yes	yes	yes	yes
kill file (and create space)	yes	yes	no	no	no	yes	yes
prepare files for transmission	yes	no	yes	yes	yes	no	yes
SCROLLING (cursor movement)							
by word	no	no	no	no	yes	no	yes
by line	no	yes	yes	no	yes	yes	yes
by sentence	no	no	no	no	no	no	yes
by screen	yes	yes	yes	yes	yes	yes	yes
to beginning or end of workspace	yes	yes	yes	yes	yes	yes	yes
to beginning or end of document	no	no	no	no	no	yes	yes
horizontal scroll	no	no	no	yes	no	no	yes
DELETE							
by character	yes	yes	yes	yes	yes	yes	yes
by word	yes	no	no	no	no	yes	yes
by line	yes	yes	no	yes	yes	yes	yes
by sentence	no	no	no	no	no	no	no
by screen	no	no	no	no	no	yes	no
by block	no	yes	yes	no	yes	yes	yes
continuous	no	no	no	no	no	no	no
INSERT							
keyphrases	none	none	none	none	none	"the"	none
typeover	yes	yes	yes	no	yes	yes	yes
insert mode	no	no	no	no	yes	yes	yes
push ahead	yes	yes	no	no	no	no	yes
split and glue a line	no	yes	no	yes	no	no	no
intermediate buffer	no	hard	no	no	yes	no	no
block whole sections	no	no	no	no	no	yes	yes
delete and restore	yes	no	yes	yes	no	no	no
SEARCH							
find phrase anywhere	no	no	no	no	no	yes	yes
find with user replace	yes	no	yes	no	yes	yes	yes
find and replace n times	no	no	no	no	yes	no	yes
find and replace all in document	no	no	no	no	no	yes	yes
find and replace all in memory	yes	no	no	no	yes	yes	no
use wild cards	yes	no	no	no	yes	yes	yes
ignore upper/lower case	no	yes	no	no	yes	yes	yes
SCREEN FORMAT							
format entire text	no	no	no	yes	yes	no	yes
format different parts	no	no	no	yes	yes	no	yes
set line length	no	no	no	yes	yes	no	yes
set tabs with cursor	no	no	yes	yes	no	no	yes
set tabs by command	no	no	no	yes	yes	no	yes

Apple or Atari Text Formatter	Apple Writer	Easy Writer	Letter Perfect	Magic Window	Superscribe II	Super Text	Wordstar
OVERALL							
display text as it will print	no	yes	no	yes	yes	yes	yes
print one file while editing another	no	no	no	no	yes	no	slow
mail-merge or file-merge	no	Xtra $	Xtra $	no	yes	Xtra $	Xtra $
most printers supported	no	yes	yes	no	yes	yes	yes
conditional formats	no	no	no	no	no	no	no
LAYOUT							
from menu	no	no	no	no	yes	yes	yes
menu may be skipped	no	no	no	no	no	yes	no
under user control	no	no	no	no	yes	no	yes
characters per inch	no	yes	yes	no	yes	no	yes
lines per inch	no	no	yes	no	yes	no	yes
width limitation	80	125	80	80	none	127	none
PAGE CONTROL							
one-line heading	yes	yes	yes	no	yes	no	yes
multi-line heading	no	no	no	no	yes	no	yes
heading and footing	no	no	yes	no	yes	no	yes
page numbering	no	yes	yes	yes	yes	yes	yes
odd/even page distinction	no	no	no	no	no	no	no
conditional new page	no	no	no	no	yes	no	yes
TEXT CONTROL							
justify	yes	yes	yes	yes	yes	no	yes
center	yes	yes	yes	yes	yes	yes	yes
phantom hyphen	no	no	no	no	yes	no	no
multiple columns	no	no	no	no	no	no	yes
reverse line feed	no	no	no	no	no	no	no
PRINTER CONTROL							
underline	Xtra $	yes	yes	no	yes	yes	yes
boldface	Xtra $	yes	yes	no	yes	yes	yes
vary boldface intensity	Xtra $	hard	no	no	no	yes	yes
super- and subscript	no	yes	yes	no	yes	yes	yes
change ribbon colors	no	no	no	no	no	yes	yes
kerning	no	yes	no	no	no	no	no
change control characters	no	yes	no	no	yes	yes	no
proportional spacing	no	no	yes	no	yes	no	yes
OUTPUT CONTROL							
interrupt/resume	no	no	no	no	yes	yes	yes
alter format	no	no	no	no	no	yes	yes
pause for text entry	no	no	no	no	yes	no	yes
pause for variable entry	Xtra $	no	no	no	yes	no	yes
start/stop as designated	no	no	no	yes	yes	no	yes
print multiple documents	no	yes	no	no	yes	yes	yes
print multiple copies	Xtra $	no	yes	no	yes	yes	yes

WHERE TO BUY IT—A List of Vendors

All of the programs reviewed here
- are widely distributed
- have legible and comprehensive documentation
- make full use of the entire video screen
- have satisfactory execution speed

CP/M-based Computers and TRS-80s			
Benchmark	MetaSoft Corporation 711 E Cottonwood, Suite E Casa Grande, AZ 85222 (800) 528-7385	$499	Not for all computers
Magic Wand	Peachtree Software Inc. 3 Corporate Square Atlanta, GA 30329 (404) 325-8533	1395	My personal favorite
Mince (Scribble)	Mark of the Unicorn POB 423 Arlington, MA 02174 (617) 489-1387	$125	The programmer's choice
Scripsit	Radio Shack POB 2910 Fort Worth, TX 76101 (817) 390-3011	$399 (Model II) $99.95 (Models I/III)	Very popular; for Radio Shack computers only
Select	Select Information Systems 919 Sir Francis Drake Blvd. Kentfield, CA 94904 (415) 459-4003	$595	Needs improvement; but very easy to use
Spellbinder	Lexisoft, Inc. POB 267 Davis, CA 95616 (916) 758-3630	$495	Relatively new but endorsed by both Exidy and Hewlett-Packard
Vedit	Compuview Products 618 Louise Ann Arbor, MI 48103 (313) 996-1299	$130	If you want to customize your own text editor
Wordstar	MicroPro 1299 4th St. San Rafael, CA 94901 (415) 457-8990	$445	The best-seller
Apple and Atari Computers			
Apple Writer	Apple Computer Inc. Cupertino, CA 95014 (408) 996-1010	$75	A best buy
Easy Writer	Information Unlimited 281 Arlington Ave. Kensington, CA 94707 (415) 525-9452	$129	Outdated
Letter Perfect	LJK Enterprises POB 10827 St Louis, MO 63129 (314) 846-6124	$150	Atari owners' best choice
Magic Window	Softape 10432 Burbank Blvd. North Hollywood, CA 91601 (213) 985-5763	$100	Best for beginners
Superscribe II	On-Line Systems 36575 Mudge Ranch Rd. Coarse Gold, CA 93614 (209) 683-6858	$130	Apple; no special hardware required for 80-column or upper/lowercase
Super Text	Muse, Inc. 330 N Charles St. Baltimore, MD 21201 (301) 659-7212	$100	My personal favorite
Wordstar	MicroPro 1299 4th St. San Rafael, CA 94901 (415) 457-8990	$375	Requires Z80 card and extra RAM board

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☐ Please rush me information on the SSG Business Productivity Packages for CP/M-based computers.

☐ Please call me right away.

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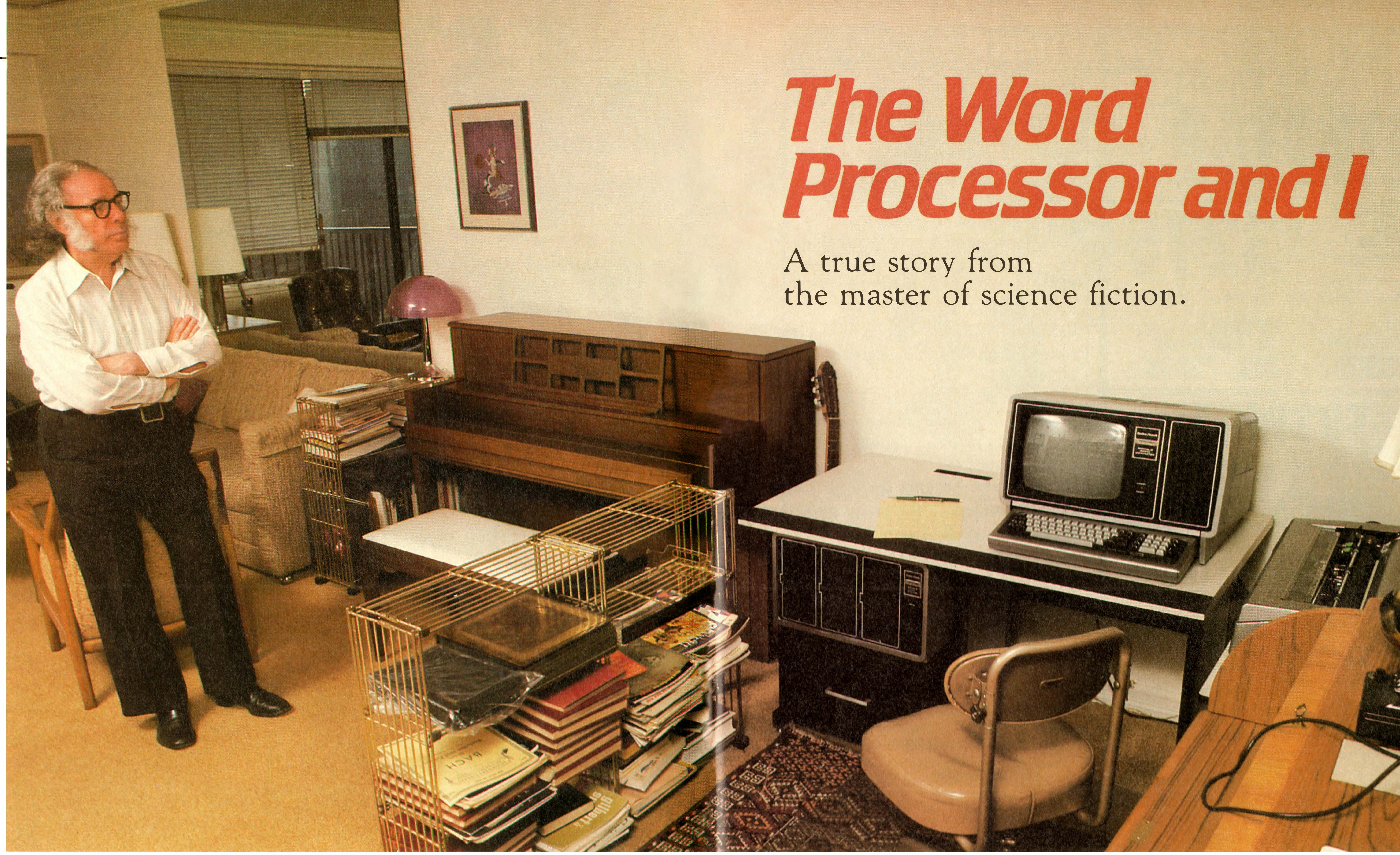


The Word Processor and I

A true story from the master of science fiction.

by Isaac Asimov

In my previous article, "I Am a Signpost" (November 1981 *Popular Computing*, page 32) I mentioned that a word processor had entered my life and described the manner in which I faced it—head high, eyes flashing, fists clenched, and brain paralyzed with fear.

Let me give you the details. When the editors at *Popular Computing* let it be known that, in their opinion, a word processor would look good in Isaac Asimov's office, Ed Juge of Radio Shack, down in Forth Worth, Texas, thought, in his warm and loving heart, that that might be a good idea. (Only today, I asked Ed, whom I have come to know and revere, whether he, down there in his Fort Worth office, ever recognized the existence of Dallas. "Do I ever recognize the existence of *what?*" he asked.) On May 6, 1981, a word processor arrived. Or at least, two big boxes and a small one, each presumably filled with arcane incunabula, came.

I managed to hoist them from the lobby of the apartment house, where the delivery men left them, up to the 33rd-floor apartment where I live. Fortunately, that was not as difficult as it sounds, since I used the elevator.

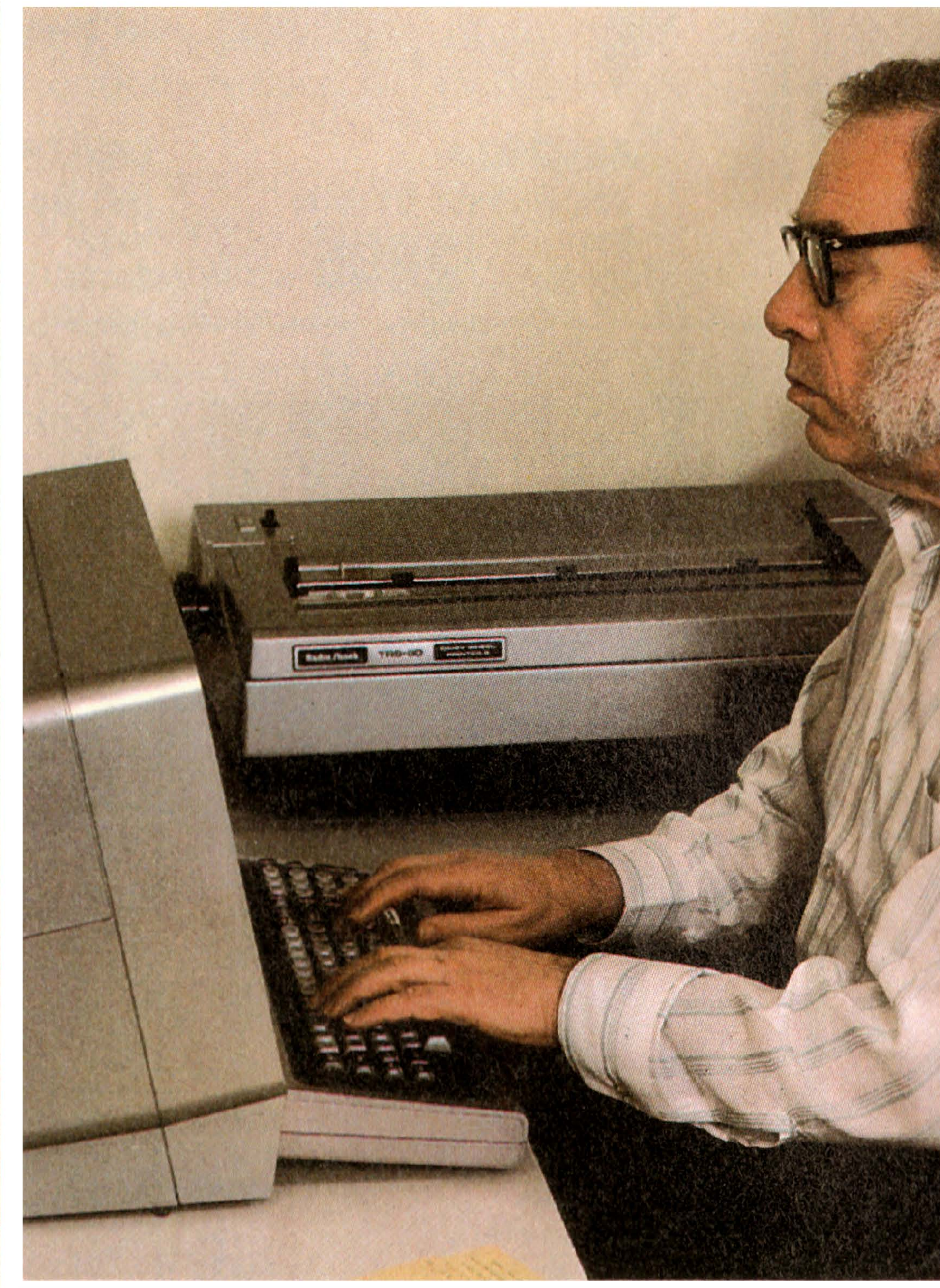
I then placed the boxes in my office and practiced walking around them until I got the route memorized. To make sure, I practiced it in the dark, then with my eyes closed, then in the dark *and* with my eyes closed.

In a few hours, I was able to walk through my office without ever making contact with the boxes or even looking in their direction. This way, I could pretend that they didn't exist. Unfortunately, several library shelves were blocked by them, but I decided not to use those shelves. If I needed data contained in the books there, I could always make it up.

This worked fine, and my heartbeat had come down to pretty nearly normal when, on May 12, Ron Schwartz of Radio Shack arrived with the intention of emptying those boxes. With the help of my dear wife, Janet, he set up a "Computer Corner" in our living room. Within it, the word processor was unboxed, hooked together, and plugged in. I did my bit, to be sure. I kept saying, "I don't think we have any space for a word processor anywhere," but no one listened to me.

In no time at all, there it was—a Radio Shack TRS-80 Model II microcomputer, along with a daisywheel printer and a Scripsit program. A bunch of floppy disks, some ribbons, and various other pieces of formidable paraphernalia were also included.

Ron then proceeded to show me how it worked. To me it seemed like a tremendously complex machine with a console reminiscent of that on a Boeing



707, but Ron, unconcerned, approached it in the most casual manner possible. He flicked the keys and had me do the same, so that different things happened on the screen. Words and sentences appeared, and parts were then erased, substituted, transferred, inserted, started, stopped. Ron paused only to stifle a yawn or two.

"You see how simple it is," he said. "If you have any difficulties, here are two instruction booklets." With an effort, he hoisted out two volumes, each the size of a Manhattan telephone directory. "This one," he said, "comes with a series of cassettes so you can hear a nice friendly voice tell you everything there is to know. And if reading and hearing the whole thing in detail isn't enough, just phone me. I'll be glad to repeat everything."

He left, and I spent the evening staring at the word processor. Staring, it turned out, was not enough. No

matter how hard I stared, and with what intensity I *thought* at it, it did nothing. With a sinking heart, I realized there was no way out. I was going to have to fiddle with the keys.

In my diary that night, I wrote: "I'll *never* learn how to use it."

Nevertheless, the indomitable spirit of the Asimovs shone through. Painstakingly, I read the instructions, doing my best not to move my lips as I did so. I listened to several of the cassettes, trying to nod intelligently at odd moments.

It didn't help. On May 27, I wrote in my diary: "Very depressed because of the word processor. Couldn't get it to double-space."

Hah! I also couldn't get it to make tables or to reduce the margins to the insignificance I find comfortable. Nor, when I attempted to print one of my concoctions, could I get it to pause between pages, even though it promised it would. It would wait for me to prepare a page, with carbons, and just before I could insert it, the thing would merrily begin imprinting the bare platen with my deathless prose.

I sat down and started the machine —and, suddenly, with no warning whatever, everything worked. It rubbed its head against my leg and purred.

On June 4, two young men from Radio Shack arrived, unfailingly pleasant, unfailingly helpful, unfailingly polite, and I wept on their shoulders in turn. Under their ministrations, the word processor behaved like a purring little pussycat, but my heart told me they'd be gone for 1½ seconds and pussycat would turn back into a Bengal tiger. My heart was not wrong.

I had, by now, developed the habit of

flinching when I passed the Computer Corner and throwing up my arm as though to ward off an attack. Occasionally, I would open one of the instruction books and would read the cheerful instructions at random, but it all echoed meaninglessly in the vacant cavity I austerely refer to as my brain.

On June 12, the word processor had been sitting in my living room for a full month, and it had so far won every battle.

But was I downhearted? Did I feel beaten?

You bet I was, and you can also bet I did!

On June 14, I decided to make one last try before asking Radio Shack to remove the thing and take its beak from out my heart. I was going to attempt to write a short article on the word processor. Actually, I had already written it in first draft on my trusty Selectric III typewriter, but it was my intention to transpose it to the screen, correct it, and then print it.

I sat down and started the machine—and, suddenly, with no warning whatever, everything worked. It rubbed its head against my leg and purred.

I will never know what happened. The day before I had been as innocent of ability to run the machine as I had been while it had still been in its original box. A night had passed—an ordinary night—but during it something in my brain must finally have rearranged itself. Now, there I was, running the machine like an old hand. In making my corrections, I could even use my right hand on both the "repeat" and the cursor arrows, without looking, and that little blinking devil jumped through every hoop in sight.

On June 17, I took the big step. I had a massive manuscript of a book in first draft. I put the entire first chapter onto the screen and then printed it.

I whistled while I worked.

Janet came by to watch and stood there transfixed. I waved my hand airily at her. "Nothing to it," I said. "All it takes is grit, determination, a sense of buoyant optimism, and good old Yankee know-how."

I've been working at it steadily ever since (with some minor problems I'll tell you about another time). In a matter of days after the transformation, in fact, I called up Radio Shack and told them to send someone over to set up the special tables that had arrived after the word processor itself had. "Put it all up, because I have decided I will keep the machine," I said. "I may even pay for it," I added, with devil-may-care insouciance.

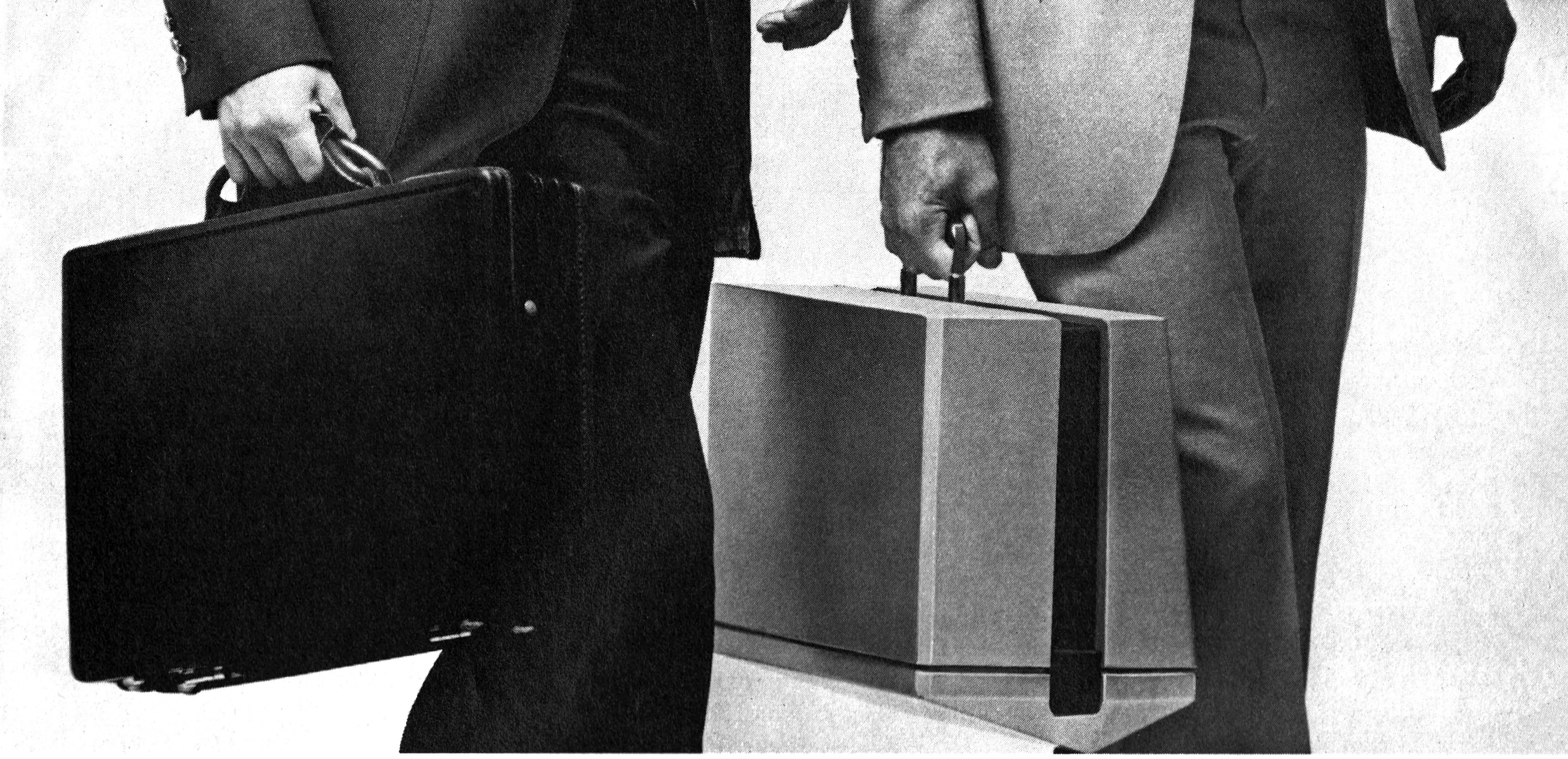
Scott Stoegbauer of Radio Shack arrived on July 8 and did the job.

I said to him, "Very friendly machine you have here. Reliable. Easy to handle. Makes no trouble. All you need is raw courage and the kind of self-confidence that can surmount all hurdles."

"You are a great man, Dr. Asimov," said that very perceptive young fellow. □

Isaac Asimov has written hundreds of science-fiction stories.

Photos by Chris Maynard



The guy on the left doesn't stand a chance.

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Writing Poetry on a Word Processor

The only taboo in America that has yet to be the subject of a movie-of-the-week.

by Peter McWilliams

We all know about poets and computers. Poets and computers populate distant extremes on the continuum of being. Poets are ephemeral, fey, ultrasensitive unicorns who live on air and inspiration and are usually consumed by consumption before the age of thirty. Computers are hard, exacting, unforgiving amalgamations of steel, plastic, and wire.

Yes, we all know about poets and computers. The idea of a poet using a computer to create poetry would probably strike most people as highly incongruous. Yet it's happening daily at great universities, in ComputerLand stores, and in stereotypical poets' hovels all over the country. Poets are poeting on *computers*.

Personal computers outfitted with word-processing programs allow prose and poetry writers to rearrange, delete, expand, correct—in a word, *change*—material being written. Word processors can change a single letter or word of a text and display the revised version instantly. Whole chunks of material can be shuffled or shifted with the touch of a "Save Block" or "Quad Left" key. Eliminated are cross-outs, erasures, and retypings. This capability is especially valuable to poets striving for visual impact as well as verbal meaning. For writers caught in the eye of a brainstorm, some software will provide definitions and rhymes for thousands of words.

To demonstrate a word processor's efficiency as a writing tool, let's examine the work of poet laureate Isadora Goose, known affectionately as "Mother." Suppose the well-known poetry journal *Humpty Dumpty* asked me to update a few of Goose's better-known rhymes. I would try to do it very much as Isadora might if she were alive today and had a word processor at her peck and call. Her classic "Little Miss Muffet" provides food for thought.

Little Miss Muffet
Sat on her tuffet
Eating her curds and whey.
Along came a spider
And sat down beside her
And frightened Miss Muffet
away.

To update rather than rewrite, I'd have to preserve the basic structure of the piece, keeping its natural rhythm and as many rhymes as possible.

One of the first words that stands out is *tuffet*. A tuffet is either a mound of grass or a stool, but Mother's meaning is unclear. She stated that Miss Muffet owned the thing when she wrote *Sat on her tuffet*. The word *Little*, however, seems to imply that Miss Muffet might be too young to be a landowner. Therefore, *tuffet* may refer to a stool or seat. On the other hand, spiders are more commonly found outdoors on grassy tuffets. It remains a puzzle and the subject of books written by people far more learned than I.

The point is, you don't hear the word *tuffet* much anymore. Real estate salespeople don't extol a garden's virtues with "exotic flowers, beautiful shrubbery, and several very nice tuffets." Furniture stores don't advertise "Dining room sets. Complete with breakfront, table, and six tuffets." No, *tuffet* will have to go. What to replace it with, though? I like the idea that Ma Goose meant a stool-type tuffet. Too many poems have been written about the beauty of the outdoors; we need more poems about the indoor wonders of the world. The nearest two-syllable word that means *stool*, remembering that we must maintain Goose's meter, is *barstool*. Everyone knows what a barstool is, even the readers of *Humpty Dumpty*.

By pressing a few keys on my word processor, the first two lines have become:

Little Miss Muffet
Sat on her barstool

Muffet must go, as it no longer rhymes. *Miss* will, of course, become *Ms*. In that light, *Little* seems a bit sexist too. This whole first line needs an overhaul.

What's a contemporary rhyme for *barstool?* Why, carpool, of course. Let's teach the kids the importance of conservation right from grade one. *Miss Muffet* is now *Ms. Carpool*, but we've lost some alliteration. Then there's *Little*. What adjective begins with an M (for the sake of alliteration) and better describes this thoroughly contemporary Ms. Carpool? *Modern* fills the bill nicely.

Modern Ms. Carpool
Sat on her barstool
Eating her curds and whey.

Curds and *whey* are the solid and liquid parts of curdled whole milk.

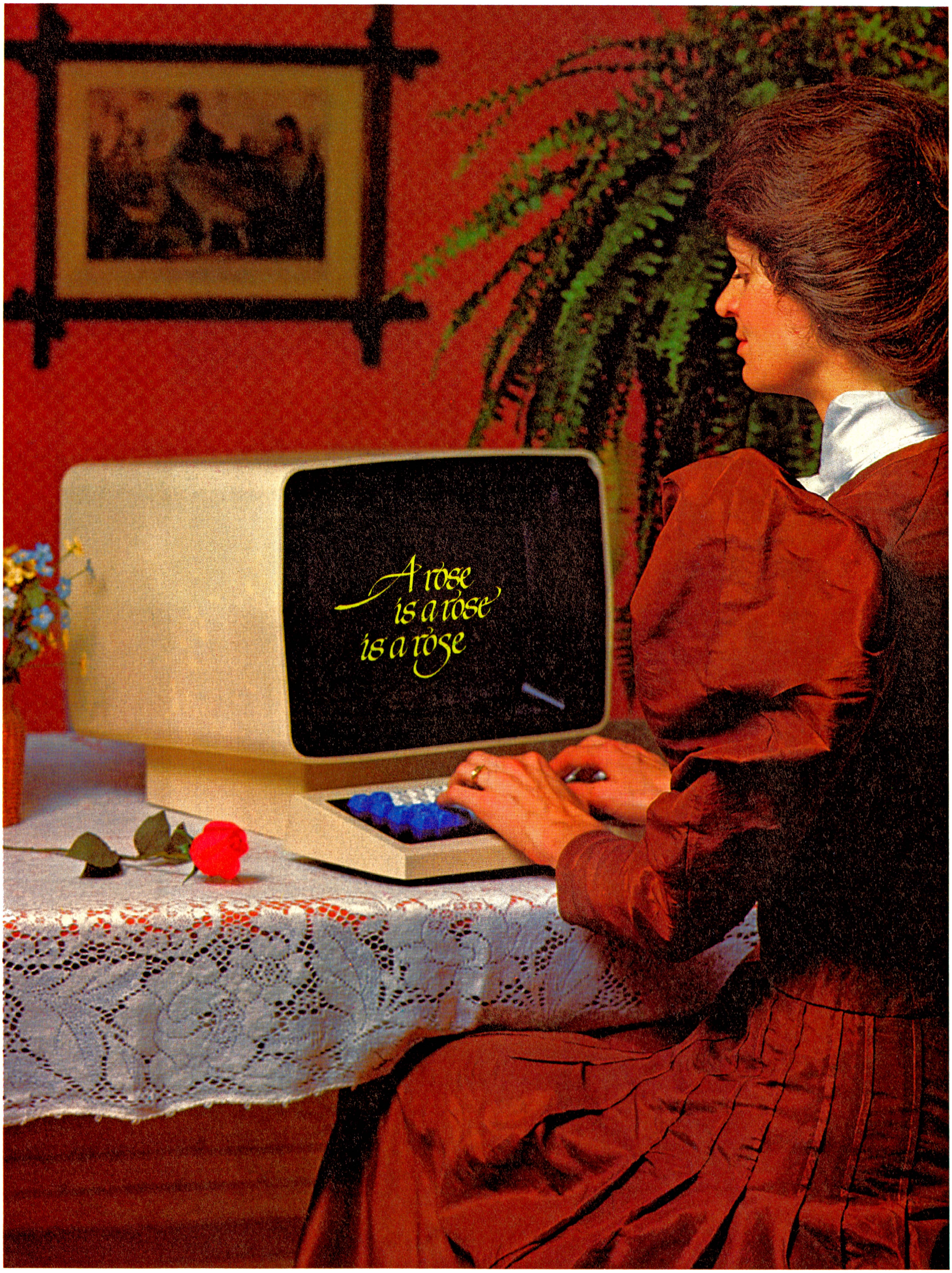


Photo by Paul Avis

Once very chic when people sat around on tuffets, the stuff has since waned in popularity. It's doubtful that Modern Ms. Carpool would be lounging at a bar, quaffing curdled milk; a banana daiquiri, maybe, but curdled milk, never. I am, however, writing for children, so I'll have her eat some other healthful dairy product.

Further, whatever she's eating will have to rhyme with *whey* to keep as many of the original rhymes as possible. I've already departed from that in the first two lines. *Muffet* doesn't rhyme with *Carpool* no matter how far you stretch it. Therefore, the original pattern must be resumed at this point.

What healthful dairy product rhymes with *whey*? Simple — *Yoplait*, a yogurt brand-name. Because *Yoplait yogurt* doesn't rhyme with curds and whey, I'll invoke my poetic license and the word processor's search and replace functions to switch *Yoplait* and *yogurt*.

Modern Ms. Carpool
Sat on her barstool
Eating her yogurt Yoplait.
Along came a spider
And sat down beside her

Spider and *beside her* make a great rhyme, bringing the rewrite process to the last line:

And frightened
Miss Muffet away.

Changing *Miss Muffet* to Ms. *Carpool* doesn't resolve all of this line's difficulties. In the first place, would *Modern* Ms. Carpool really be frightened away by a spider? I doubt it. She might not appreciate its company much but not to the point of relinquishing her barstool. We could end the poem with *Said she, 'Would you please go away?'* making Ms. Carpool a graduate of assertiveness training, but this too skirts the real issue.

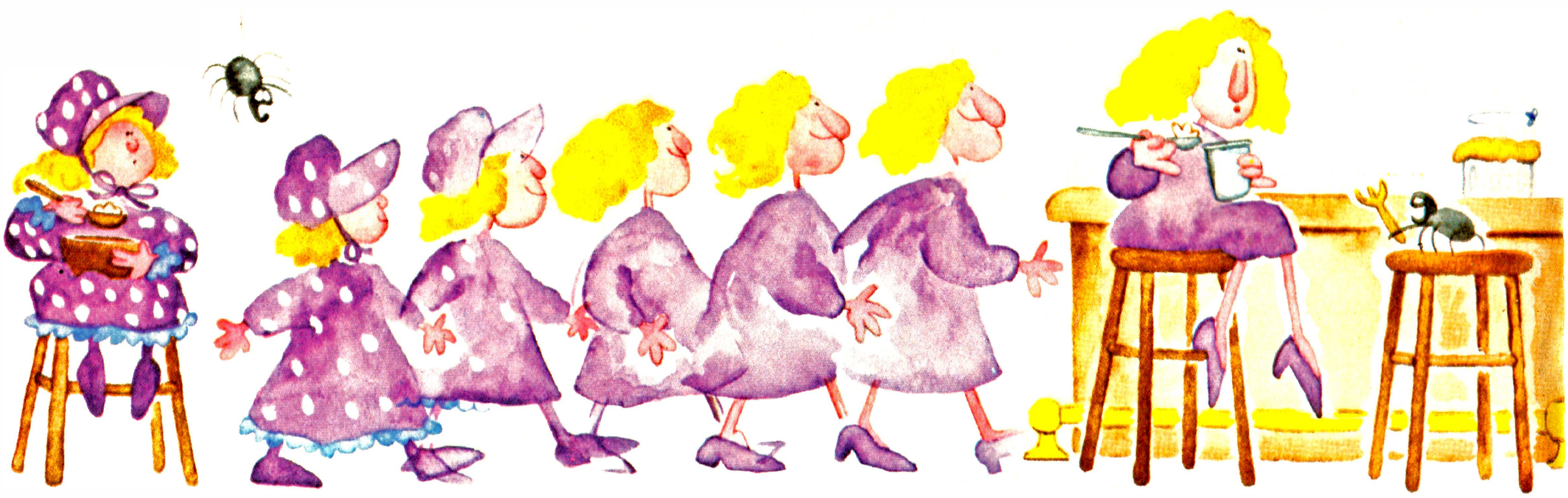
The real issue concerns our feelings toward spiders. Long the butts of unjustified prejudice, spiders actually are our natural allies (with the possible exception of black widows and tarantulas). They eat mosquitos, flies, and all those other creepy-crawly things against which we have justified prejudices. It's time we changed, and change must come through education, which begins with bedtime nursery rhymes. I'll make the spider an ordinary guy.

Goose's scenario has evolved into the following: Ms. Carpool is sitting at a bar, eating yogurt. A spider comes along, sits down next to her and orders something to eat, just like Ms. Carpool. But what would a spider order? Spiders don't eat yogurt, mosquito-flavored or otherwise. They eat bugs. His going to a bar, though, and ordering a plate of bugs would definitely be out of the ordinary. How can I add a little normalcy and class to the situation yet, being locked into a pattern, rhyme his order with *Yoplait?*

I'll make this spider a gourmet, one determined to impress the dairy delight on his right by ordering bugs prepared in some French-sounding way such as sauté or flambée. *Bugs* has a strange ring to it, so I'll modify that a bit too. By adding this last line to the computerized Mother Goose update, *voilà!*

Modern Ms. Carpool
Sat on her barstool
Eating her yogurt Yoplait.
Along came a spider
And sat down beside her
And ordered an insect
soufflé.

Originally, there were twenty-six words in the poem. By changing only eleven of them, the entire piece was transformed into something quite different. Fifteen Goose words, however, remained intact. With a word processor, there was no need to retype a pinfeather's worth.

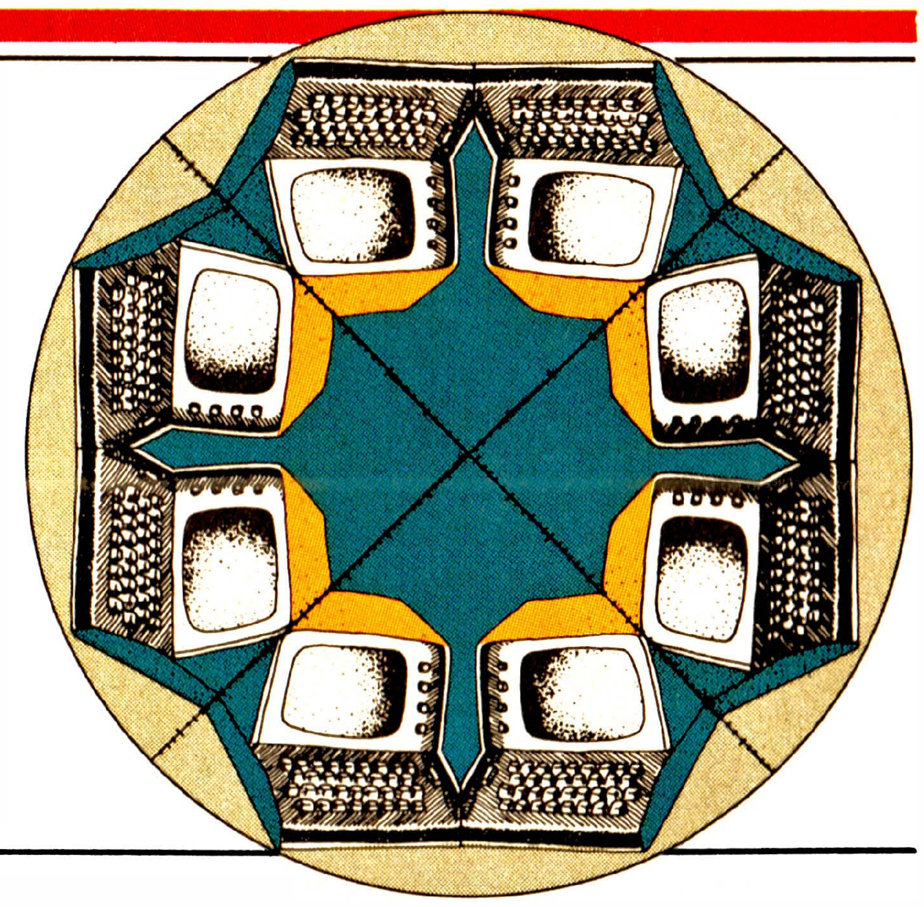


The nonsense above is a parody of what goes on in the creative mind as it coaxes and hones the English language into poetry. Yet behind the fun is depicted the original word processor: the human mind. Poets and other writers now have a tool that remembers and displays the best of what they have created. With it, experimental alterations can be made quickly, silently, and nearly effortlessly. Moreover, this electronic servant will wait, alert and ever-ready, for the next command, whether it be in five seconds or five days. A tool such as this just might free the poet's mind of the mundane and allow true inspiration to flow unfettered. □

Peter McWilliams, an inveterate word-processor poet, has published 20 books of verse.

Illustration by Chris Demerest

Electronic Barter



by Harris Brotman

Today, by connecting your personal computer to a telephone, you can participate in the ancient art of barter. Instead of the village square, the marketplace now becomes a nationwide electronic network (Bartermart, which is accessed through The Source) where you can swap goods and services—an activity foreign to most of us since our bubble-gum-card days.

Bartering, second nature to most people living in the early part of the nineteenth century, gradually became the province of the professional deal maker. When cash became the medium of exchange, the practice of bartering was, for the most part, abandoned.

Enter inflation. With the increasingly swift erosion of the dollar's value, bartering is enjoying a renaissance. Two years ago, Bartermart became the first worldwide, public-access, barter timesharing network. Its founders, Mike Jeffries and Jack Johnson, intended it to help companies and families offset day-to-day operating costs while locating hard-to-find markets and products.

A subscription to The Source puts a tremendous capacity at your fingertips. Bartermart links you to a national and international trading post, greatly increasing the probability of your finding a barter partner whose "haves" and "wants" match yours. "It's simply a matter of getting the right traders together," said Jeffries.

How Bartermart Works

The good news is that Bartermart doesn't cost a cent to join. You pay only your online Source user's fee. You pay nothing extra until you arrange a trade through Bartermart. Once the deal is made, you pay a commission: 10 percent of the cash value of the trade or 15 percent if Bartermart wants to trade the commission itself. For real estate, Bartermart charges a finder's fee of 1 percent of the market value of the property. The minimum retail value of trades that Bartermart will handle is $500.

For Example

Let's say you own a company that manufactures widgets. Each widget costs $500 to make and retails for $1000. Your annual advertising budget is $5000. In our example, you'd have to sell 10 widgets to pay for your annual advertising, if you decide to use cash. Through Bartermart, however, you find an advertising company in need of widgets. Bartermart allows you to trade widgets at fair-market value; in other words, you can trade five $1000 widgets for $5000 worth of advertising. Since your cost for the widgets and Bartermart's commission was only $3000, you, as well as the advertising company, just saved a lot of money.

Helpful Tutorials

When you go online with Bartermart, a menu appears offering tutorials that explain the art of barter, the philosophy of trading, the tax advantages of bartering, or what to do when you scan the listings and find a deal that piques your interest. These tutorials are intended to help you become a better trader, giving you the rationales behind sophisticated trading techniques and ways of exchange between more than two parties.

To start, decide what kinds of trades you want to participate in. You should ask yourself two questions: What do I spend money on? What materials do I use in my business? The answers will give you a good idea of what you're looking for in a trade.

But what do you have to offer in return? Whatever it is, you've got to be able to make a prospective trading partner say, "Wow!!! I'll take it." When that happens, you have, in the parlance of traders, pressed your counterpart's "hot button." However, since different prospective clients are seeking different things in any trade, they may have different hot buttons. This is why it is important that your listing on Bartermart contain as many details as possible.

For example, if you're trading a sailboat, don't list it simply as a "35-foot sailboat." Improve the listing in the following fashion—the boat has won numerous races, holds a class record, and has brand-new sails.

If you offer your services on Bartermart, the same rule applies. Whether you are a photographer, carpenter, attorney, or physician, include in your listing what it is—an area of specialization, awards, special training—that distinguishes you from your peers.

What happens if you see something you want, but don't have what the listing party is looking for in return? "Send us your listing anyway," says Bartermart, ". . . someone needs what you have or we wouldn't be in

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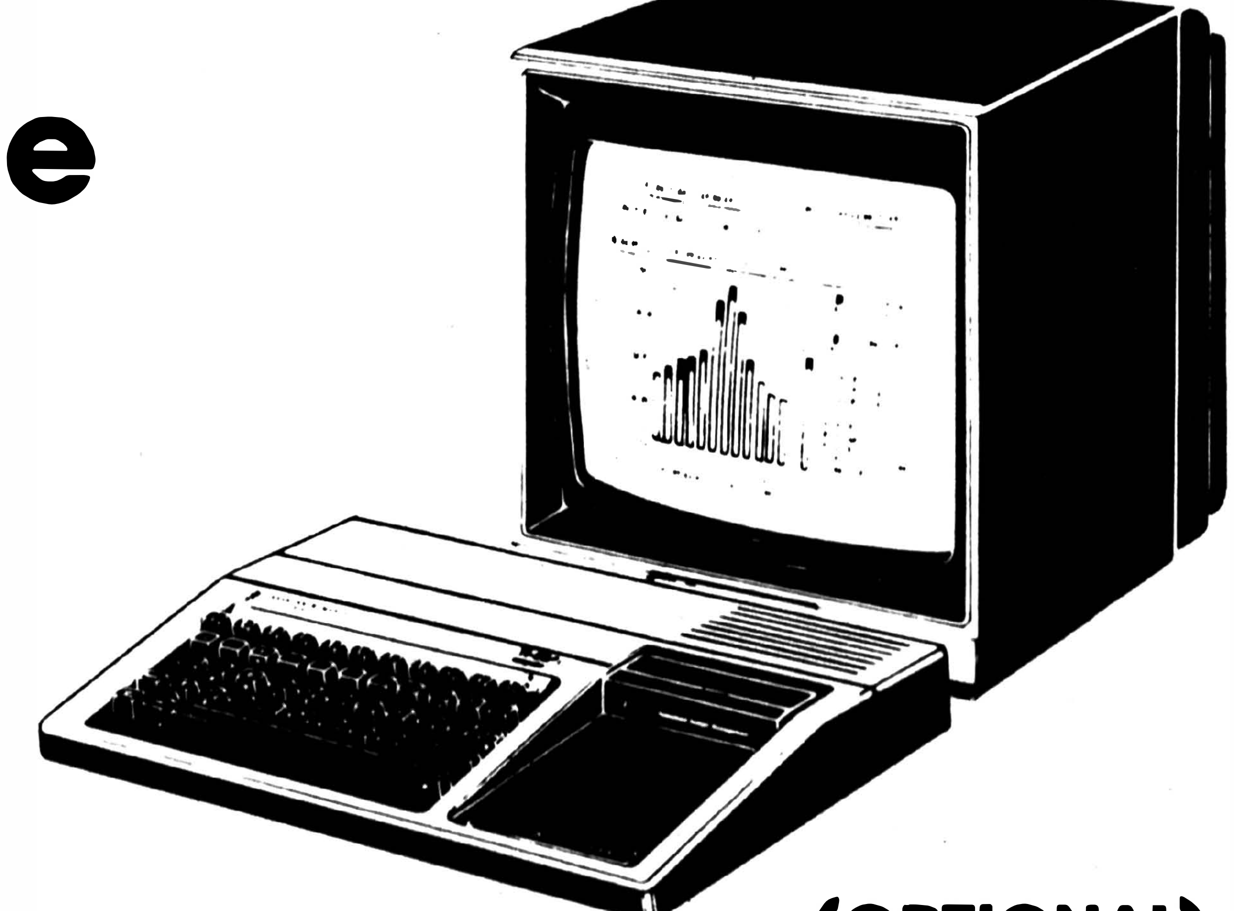

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Bartermart works with small clients who want vacations, as well as big companies desiring to trade goods and services running into the hundreds of thousands of dollars. Trades involve items such as office supplies, hotel accommodations, car rentals, photographic equipment, employee benefit/bonus packages, air travel—you name it.

"Effective barter," says the Bartermart Tutorial, "is most appropriate for goods and services whose markup from cost is 30 percent or more or when the goods/services are seasonal or sustain losses due to 'no-shows,' as in hotel accommodations, airline tickets, advertising time/space, unfilled consultation hours, etc."

Using electronic mail, Bartermart sidesteps the time-consuming postal service for transferring documents, contracts, and specifications of the trade. But once your listing goes "up in lights," two factors determine the speed of the trade: demand for your offering and your flexibility on the "want" side. A rare matchbook collection won't press as many hot buttons as computer hardware, ski condominiums, or precious gems. If you are only willing to accept a moon rock for your demand item, your deal may never occur.

If your offering is an item that businesses spend money to purchase, it will trade well. "Barter produces the greatest leverage and conserves the greatest amount of operating capital when it is used to defray expenses, since in a business these are tax deductible."

In barter, utility, not price, is the key. "People and businesses are interested in trading for commodities for which they lack the requisite cash, but which they nevertheless need in order to continue operation."

As inflation and interest rates soar, the value of our dollars dwindles. Telecommunications, timesharing, and the convenience of personal computers have removed the barriers to a large barter marketplace. The world's oldest way of exchanging fish for pelts, beeswax for ostrich feathers, and buttons for horse liniment is now online. □

Harris Brotman is a freelance science writer living in Norwich, Vermont.

Office Data Banks

Billions of bytes of data are only a phone call away.

by Steve Ditlea

In today's business world, computerized knowledge is power. Up-to-the-minute information stored in aptly named "data banks" has proven its worth in dollars and cents to organizations with millions to spend on data retrieval. Instant access to financial statistics, agricultural prices, international trade figures, industrial trends, government regulations, technological developments, current events, and even weather forecasts can offer a decisive edge in an important negotiation, business plan, or investment strategy.

Until recently, only big businesses could afford the expense of having large mainframe computer systems on call with billions of bytes of data, continuously updated. The advent of microcomputers, however, now makes it possible for the small business to have the same intelligence-gathering abilities as its larger rivals—with an outlay of hundreds, not millions, of dollars.

Easily connected to your business microcomputer via a modem telephone attachment and a locally dialed data network (Tymnet or Telenet), a data bank is exactly what it sounds like—a large minicomputer or mainframe computer memory bank containing information that can be dispensed directly to your computer screen or printer. The fee can be as low as a few dollars an hour for access time or as high as hundreds of dollars an hour, including central processor costs. In addition to transferring information as diverse as stock quotations and medical abstracts, many commercial data banks also offer an opportunity for small businesses and professional offices to employ the number-crunching and file-storage capabilities of large-scale computers.

Several data banks, including The Source, CompuServe's MicroNET, and the Dow Jones News & Stock Quote Reporter, are being aggressively marketed for microcomputer users. The Source reports that 40 percent of its 12,000 users subscribe to its consumer-oriented data bank for business reasons. Also accessible to any microcomputer or dedicated terminal printer owner are general- and special-interest databases regularly consulted by large firms. Randolph Hock, a regional representative for the Dialog Information Retrieval Service (a division of Lockheed Missiles and Space Company, Inc.), reports that while training classes (at $65 per person) are just beginning to include small-business users, they are expected to become an important part of the system's subscriber base.

The actual start-up routines or "protocols" differ, but access to a data bank usually requires no more than turning on a computer, telephoning the local data network with its distinctive high-pitched drone, and keying in an ID code and password (available from the data bank), with software often automating the entire sign-on procedure. A specific piece of information can be found by entering simple one- or two-word commands to search the appropriate database (a data bank can consist of dozens of databases from different sources) by keyword, category, or date. In minutes, you can retrieve financial reports on any of 11,000 publicly owned companies, listings of the last six months' worth of major press stories concerning Small Business Administration loan policies, airline schedules for any destination in the world, or reviews of top restaurants.

None of the existing data banks is specifically designed for the small-business user, though several small-business databases are planned to debut this year. In the meantime, small-business computer users can effectively employ data banks designed for consumers or big businesses by learning the features and limitations of each system. A little preplanning of search commands—and alternate strategies should the data bank draw a blank on an initial request for information—will save you a considerable amount of online time charges, when every minute counts. A warning: even with the best of planning, it is easy to become a "dataholic" subscribing to several data banks and using stream-of-consciousness search strategies to call up everything from the latest Jack Anderson column to an Adventure game that can be played for days on end.

As of this writing, The Source and CompuServe's MicroNET are closely matched in terms of services offered and subscriber bases, as well as their usefulness to small business, which is still somewhat limited (Apple users tend to favor The Source; CompuServe, sold through Radio Shack dealers, is the favorite of TRS-80 owners). For instance, both The Source's Unistox and CompuServe's

MicroQuote will give you periodically updated stock prices in the course of a business day, but neither can match the 15-minute delay offered by Dow Jones, which is limited to financial news. The Source offers UPI News and the *New York Times* Consumer Data Base; CompuServe serves up AP reports and news stories from 11 major U.S. dailies. However, neither can provide the coverage of Dialog's Magazine Index with its monthly abstracts of 370 popular magazines.

The advantage of The Source (owned by *Reader's Digest*) and CompuServe (a division of H&R Block) is that they are relatively inexpensive introductions to the possibilities of data banks. For example, after an initial $100 connection fee, The Source charges $18 per hour during business hours ($5.75 evenings, $4.25 after midnight) for its most popular services (storage of user files in central memory and custom services like Information on Demand are additional). The Source has recently inaugurated premium-priced plus services ($30 per hour during business hours), including Legi-Slate, which tracks the status of congressional legislation, Management Contents, Ltd., summarizing the contents of 27 leading business publications, and Media General, detailing the background of 3100 stocks, updated weekly. CompuServe's $22.50 per business hour basic fee is augmented by individual search charges; for example, MicroQuote bills an access fee of $1 every time it is used, plus transaction fees running from $.05 per daily stock quote to $1.25 to examine an issue in detail.

Both data banks offer central processing services for financial modeling or information storage. Who needs a hard-disk memory for sophisticated business applications when you can have an entire memory bank at your disposal? CompuServe has a bit of an advantage with its specialized software geared to such industries as mining and biomedical research, while The Source offers program routines for annuities analysis, loan interest, lease versus purchase of equipment, and many other standard business calculations. Both The Source and CompuServe offer electronic-mail services. At present, The Source's service is easier to use.

A little more expensive and far more eclectic is Dialog, which began in 1963 as an in-house research project at Lockheed. Today, this data bank can access more than 120 different databases at rates ranging from $15 to $300 per hour, with no installation fee or monthly minimum. Among these useful databases are Adsearch, indexing advertisements in 148 magazines; Disclosure, extracts of reports filed with the S.E.C. by every publicly owned firm in the nation; Eis Plants, covering 130,000 industrial plants across the U.S.; Excerpta Medica, abstracts from 3500 biomedical journals; National Foundations, records of 21,800 U.S. foundations; Scisearch, listing significant items from 2600 scientific journals;

and Trade Opportunities, providing leads to sales abroad. With such a wealth of information at your fingertips, it is strongly suggested that a new user invest in a one-and-a-half-day training session and the purchase of a guide to the various databases for $30.

Dialog's Magazine Index of 370 periodicals and its Newsearch current events file, drawn from 1400 publications, are comprehensive enough to make the much-touted *New York Times* Information Service, accessing the *Times* and 90 other publications, seem minor league by comparison. For specialized purposes, there are other databases to choose from, like Informatics' HSL for highway safety literature, or ADP Network Services' Datalyst for macroeconomic data and projections.

In the luxury category of office data banks are those requiring custom terminals. Mead Data Central's Lexis system, for example, uses a terminal with an additional 37 custom keys on its keyboard. As the premier legal-research database, Lexis has proven invaluable in uncovering important legal precedents that might have gone undiscovered using print-only retrieval methods. Lexis costs mount up: $350 for installation and $95 per month for a simple terminal, $50 monthly subscription charge and library access charge of $350, one-time $75 training fee for every lawyer, accountant, and librarian in the firm, plus hourly connect-time charges ranging from $21 to $90, plus a search surcharge. . . . Still, any small law office may find that Lexis more than pays for itself in cost-effective research, according to Janet Wikler of Mead Data Central. "I think it's true of any data bank that its cost should be weighed against the savings in time and efficiency. How important is it for you to have instantaneous information retrieval in your business? If it is at all important, even a small firm can find a data bank worth the expense." □

Steve Ditlea is a regular Popular Computing *columnist focusing on computers in small business.*

For more information

ADP Network Services
175 Jackson Pl.
Ann Arbor, MI 48106

CompuServe Information Services, Inc.
5000 Arlington Centre Blvd.
Columbus, OH 43220

Dialog Information Services, Inc.
3460 Hillview Ave.
Palo Alto, CA 94304

Dow Jones News Service
22 Cortland St.
New York, NY 10007

Informatics Inc.
6 Kingsbridge Rd.
Fairfield, NJ 07006

Mead Data Central
200 Park Ave.
New York, NY 10166

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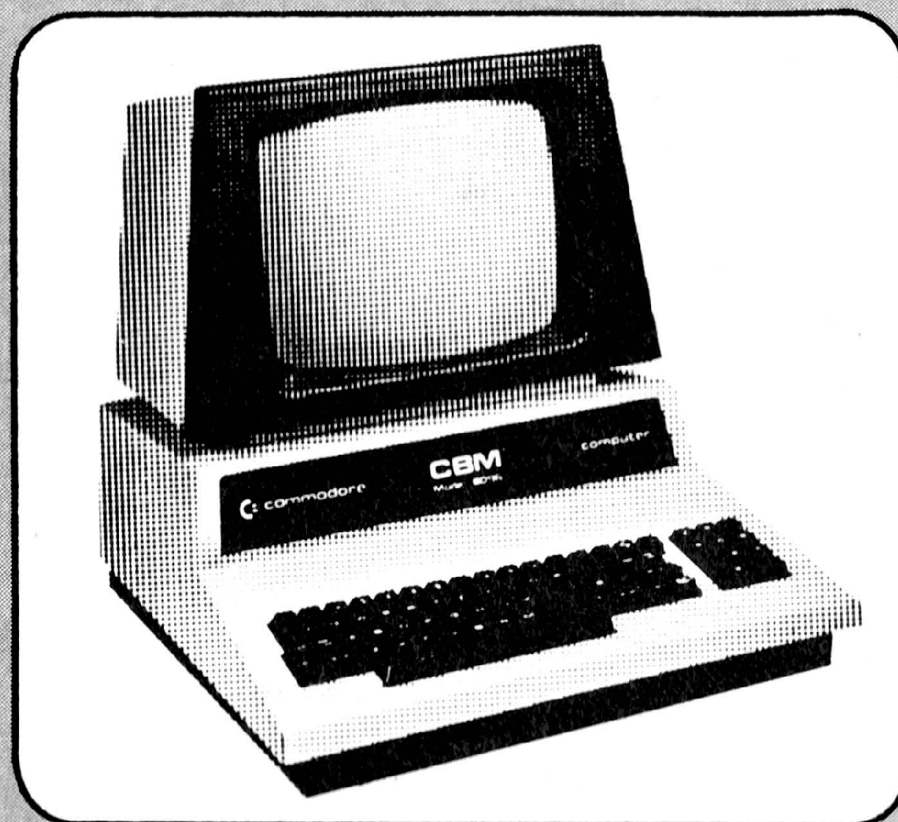

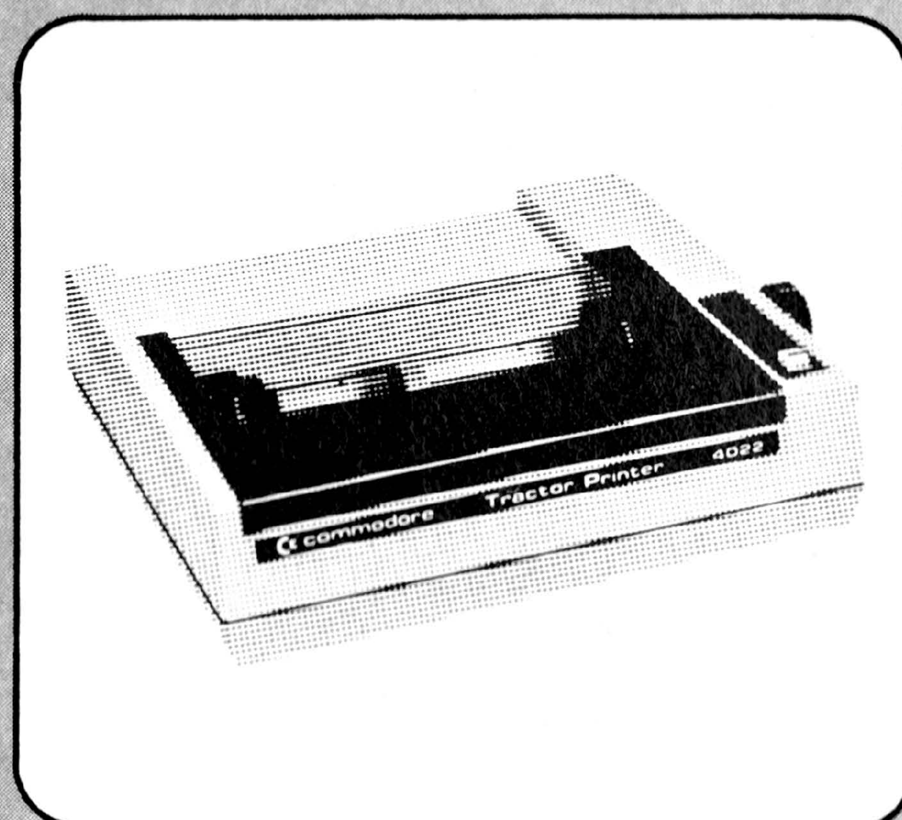

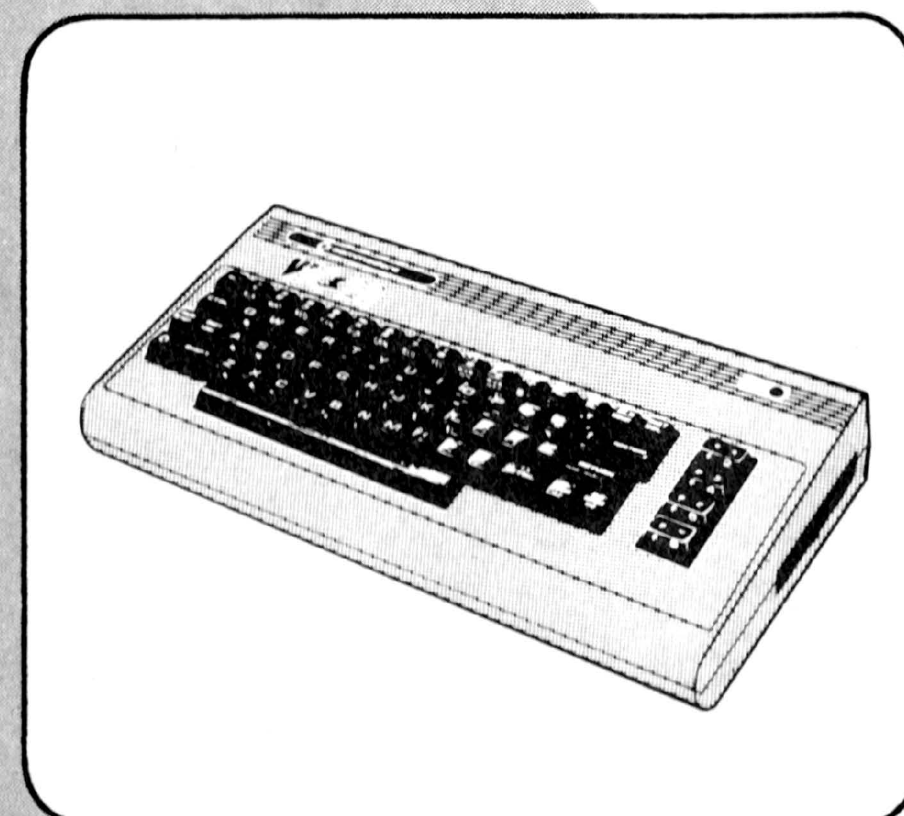

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Paul Lutus High-Tech Dropout

Story and photos by A. Richard Immel

The answering machine gives you a provocative hint of what's going on in the Lutus household: "Hi. There are no people here now—just computers. So it goes. . . ." A visit to Paul Lutus's southern Oregon home is more revealing, but the route is tricky and a little deceptive. A narrow road winds back from the Redwood Highway through scrub brush, cedar, and sugar pine to a sign that says "LUTUS." You're not there yet, though; it's in a clearing higher up the mountain.

So too, Paul Lutus isn't what he appears to be. A six-footer with large glasses, receding hairline, and a red, mountain-man beard, Lutus lives in a rustic, self-built cabin on the edge of the wilderness, 400 miles north of San Francisco. In faded cords, sport shirt, and running shoes, he could easily pass as just another dropout in an area renowned for its dropouts, living on yogurt and the produce from his own garden.

Lutus *is* a dropout of sorts, but not the usual kind. He lives in this quiet corner of the Northwest because he likes the solitude, and the solitude lets him do what he does best: create computer programs. Indeed, Paul Lutus is considered one of the best microcomputer programmers in the business.

Lutus is the author of dozens of programs for personal computers, including the original Apple Writer word processor, which he's just updated into a new, more powerful version. Others are Musicomp, the first program to play real music through Apple's tiny "beeper" speaker; Apple World, the first microcomputer program to manipulate three-dimensional structures on the screen; and a fast action game called Space Raiders, popular enough to hit the computer game best-seller charts. Lutus has also written solar tracking programs for NASA's Viking Lander team and recently completed a new version of a high-level computer language called TRANSFORTH that he's developing as an improvement over BASIC and Pascal.

He's even found that personal computers can move mountains—or prevent them from being moved.

When all else fails, Lutus charms his Apple III with the dulcet tones of his recorder.

At the age of 36, Paul Lutus is doing exactly what he wants to do. His lifestyle is a curious mix of the simple and the sophisticated. He flies his own airplane, a four-seat Cessna 172, but keeps a bicycle in the backseat and rides it from the airport to his appointments. When the mood strikes, he takes his backpack off the wall and treks through the woods behind the cabin to the Pacific Ocean, a six-day round trip. His cabin sports an astronomical telescope, but no toilet; there's a shower stall in the living room, book-lined walls (everything from the TTL Data book to Shakespeare to a slim volume of his own poems), and several musical instruments. There's also a stereo, a color TV, a shortwave radio, and, on the wall, a couple of framed certificates of recognition from NASA for work he did on the Space Shuttle Columbia. And of course, there are the computers. A 1300-foot extension cord powers a pair of Apples—a new Model III and an older Model II that has been stripped from its case for easier access to its innards.

If this hodgepodge of low-tech/high-tech living seems a bit incongruous,

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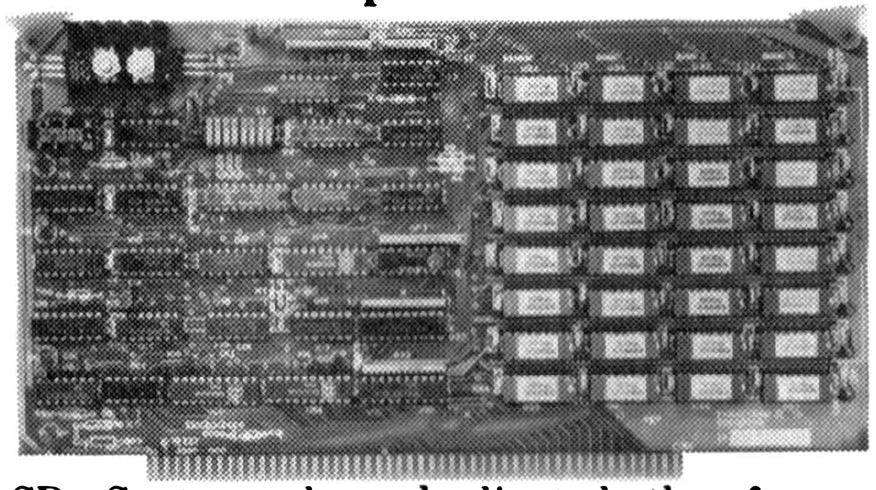
-All boards are assembled and tested-

ExpandoRAM III

64K to 256K expandable RAM board



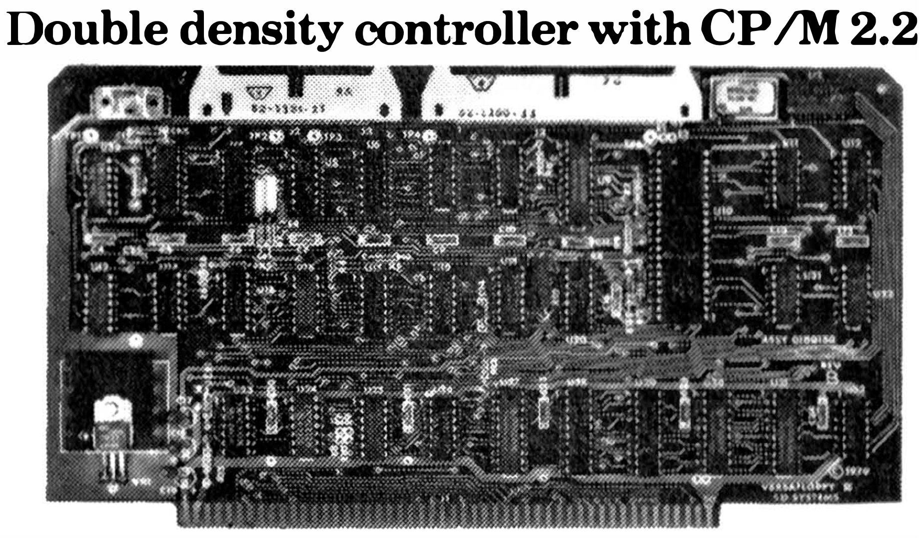
SD Systems has duplicated the famous reliability of their ExpandoRAM I and II boards in the new ExpandoRAM III, a board capable of containing 256K of high speed RAM. Utilizing the new 64K x 1 dymanic RAM chips, you can configure a memory of 64K, 128K, 192K, or 256K, all on one S-100 board. Memory address decoding is done by a programmed bipolar ROM so that the memory map may be dip-switch configured to work with either COSMOS/MPM-type systems or with OASIS-type systems.

Extensive application notes concerning how to operate the ExpandoRAM III with Cromemco, Intersystems, and other popular 4 MHz Z-80 systems are contained in the manual.

MEM-65064A	*64K A & T*	**$495.00**
MEM-65128A	*128K A & T*	**$639.95**
MEM-65192A	*192K A & T*	**$769.95**
MEM-65256A	*256K A & T*	**$879.95**

Versafloppy II

Double density controller with CP/M 2.2



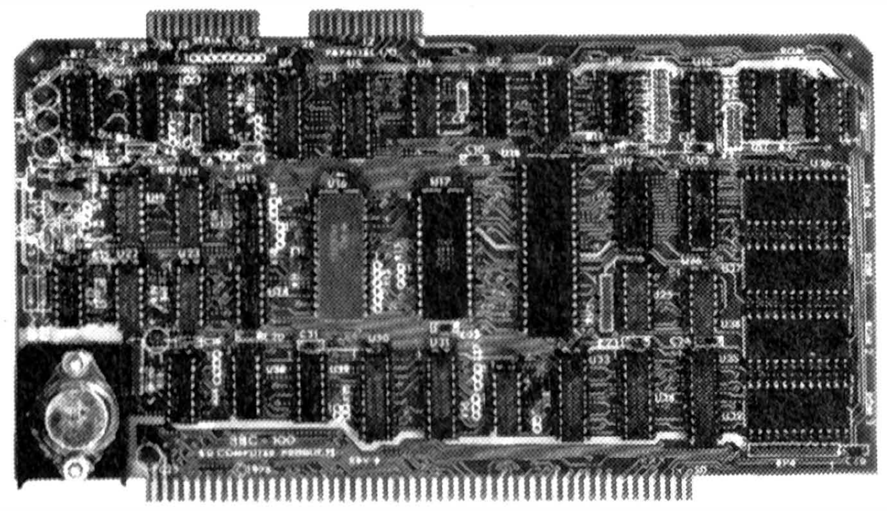
• S-100 bus compatible • IBM 3740 compatible soft sectored format • Controls single and double-sided drives, single or double density, 5¼" and 8" drives in any combination of four simultaneously • Drive select and side select circuitry • Analog phase-locked loop data seperator • Vectored interrupt operation optional • CP/M 2.2 disk and manual set included • Control/diagnostic software PROM included

The Versafloppy II is faster, more stable and more tolerant of bit shift and "jitter" than most controllers. CP/M 2.2 and all necessary control and diagnostic software are included.

IOD-1160A *A & T with CP/M 2.2* .. **$370.00**

SBC-200

2 or 4 MHz single board computer



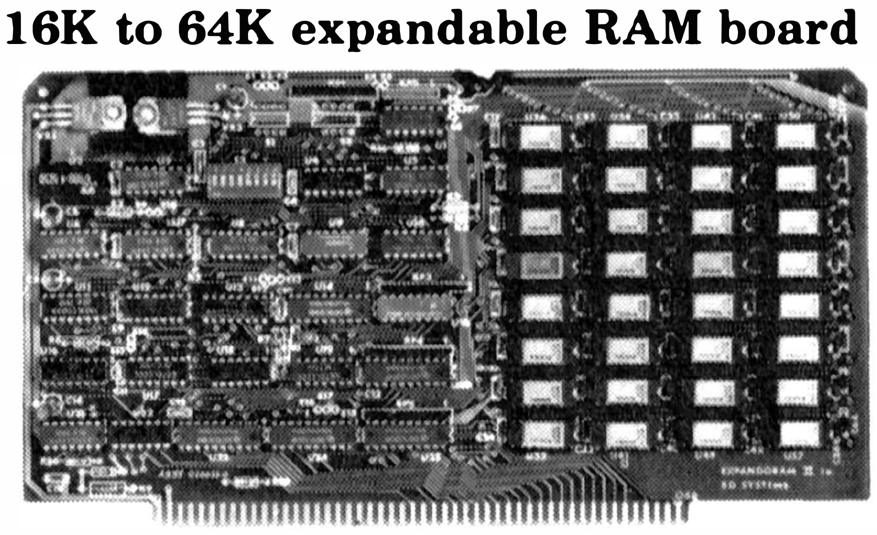
• S-100 bus compatible • Powerful 4MHz Z-80A CPU • Synchronous/asynchronous serial I/O port with RS-232 interface and software programmable baud rates up to 9600 baud • Parallel input and parallel output port • Four channel counter/timer • Four maskable, vectored interrupt inputs and a non-maskable interrupt • 1K of on-board RAM • Up to 32K of on-board ROM • System monitor PROM included

The SBC-200 is an excellent CPU board to base a microcomputer system around. With on-board RAM, ROM, and I/O, the SBC-200 allows you to build a powerful three-board system that has the same features found in most five-board microcomputers. The SBC-200 is compatible with both single-user and multi-user systems.

CPU-30200A *A & T with monitor* **$299.95**

ExpandoRAM II

16K to 64K expandable RAM board



• S-100 bus compatible • Up to 4MHz operation • Expandable from 16K to 64K • Uses 16 x 1 4116 memory chips • Page mode operation allows up to 8 memory boards on the bus • Phantom output disable • Invisible on-board refresh

The ExpandoRAM II is compatible with most S-100 CPUs. When other SD System' series II boards are combined with the ExpandoRAM II, they create a microcomputer system with exceptional capabilities and features.

MEM-16630A	*16K A & T*	**$325.00**
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COSMOS

Multi-user operating system

• Multi-user disk operating system • Allows up to 8 users to run independent jobs concurrently • Each user has a seperate file directory

COMOS supports all the file structures of CP/M 2.2, and is compatible at the applications program level with CP/M 2.2, so that most programs written to run under CP/M 2.2 or SDOS will also run under COSMOS.

SFC-55009039F *COSMOS on 8" disk* **$395.00**

Multi-User System

SBC-200, 256K ExpandoRAM III, Versafloppy II, MPC-4 COSMOS Multi-User Operating System, C BASIC II

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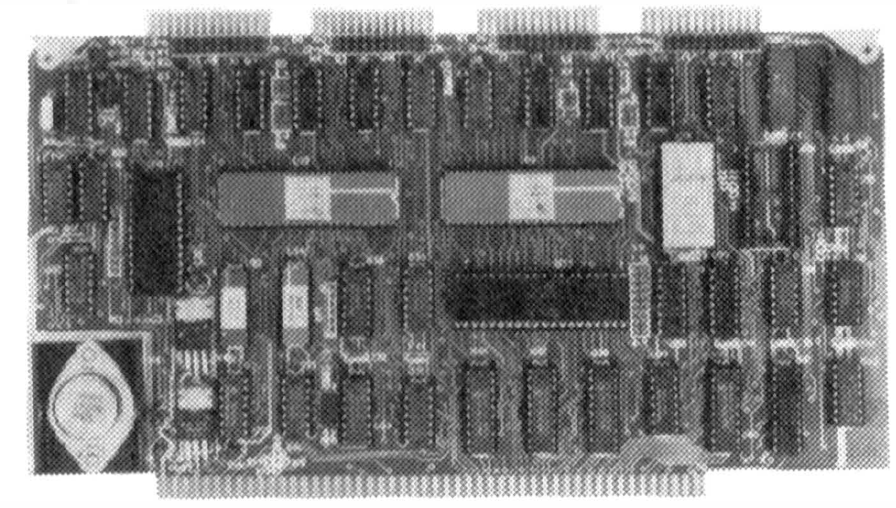
Two Z-80A CPUs (4 MHz), 256K RAM, 5 serial I/O ports with independently programmable baud rates and vectored interrupts, parallel input port, parallel output port, 8 counter/timer channels, real time clock, single and double sided/single or double density disk controller for 5¼" and 8" drives, up to 36K of on-board ROM, CP/M 2.2 compatible COSMOS interrupt driven multi-user disk operating system, allows up to 8 users to run independent jobs concurrently, C BASIC II, control and diagnostic software in PROM included.

-All boards are assembled and tested-

MPC-4

Intelligent communications interface



• Four buffered serial I/O ports • On-board Z-80A processor • Four CTC channels • Independently programmable baud rates • Vectored interrupt capability • Up to 4K of on-board PROM • Up to 2K of on-board RAM • On-board firmware

This is not just another four-port serial I/O board! The on-board processor and firmware provide sufficient intelligence to allow the MPC-4 to handle time consuming I/O tasks, rather than loading down your CPU. To increase overall efficiency, each serial channel has an 80 character input buffer and a 128 character output buffer. The on-board firmware can be modified to make the board SDLC or BISYNC compatible. In combination with SD's COSMOS operating system (which is included with the MPC-4), this board makes a perfect building block for a multi-user system.

IOI-1504A *A & T with COSMOS* .. **$495.00**

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you've got the picture. Welcome to Oregon and the unique world of Paul Lutus: electronics engineer, teacher, musician, poet, master computer programmer, and seventh-grade dropout.

Lutus's accomplishments are impressive enough in their own right, but even more so when you discover that he's never been to college and is totally self-taught in both electronics and computers. His success is the result of native intelligence, intense curiosity, and a restlessness that has kept him on the move since age 16.

Having abandoned city living, Lutus sees his life-style as a page out of Alvin Toffler's futurist book *The Third Wave.* "I want people to know they don't have to live in the city to work," he explains. But before you pack your bags, sell your house, and head for the high country, you should know that Lutus is different from most of us in some significant ways.

"He's a genius," declares Joe Shelton, a product manager for Apple Computer Inc. The two met several years ago when Lutus offered Apple the original Apple Writer program; they have worked closely ever since. "He's very unconventional; he doesn't think like normal people think," Shelton says, attributing the Lutus difference to his isolation and the fact that he simply doesn't have the day-to-day concerns that city people have. But while his environment encourages creative, conceptual thinking, it also tends to make Lutus pretty much of a purist. That can create problems in the pragmatic world of computer companies. In the case of the revised Apple Writer, for example, Lutus and Apple locked horns over the issue of operating systems, the built-in "housekeeping" programs most computers use to coordinate disk operations. (Lutus avoids them because they slow his programs down.) The dispute ended in an uneasy compromise: Lutus was allowed to bypass the operating system for the most crucial part of the program.

Hallmarks of Lutus programs are user-friendliness, tight coding, and speed. Lutus has no patience with a program that a person can't run and understand in five minutes without an instruction manual, and he makes his own programs easy to understand with on-screen prompts and instructions. His programs generally consume about one-third as much computer memory as others, run more rapidly, and are turned out more quickly.

"Typically, a programmer says he'll give you something in one week and you get it two months later," says Jay Gottlieb, head of United Software in New York City. "Paul will say a week and you'll get it three days early." United has distributed several of Lutus's programs in versions for Apple, Atari, and PET computers. "He tells you what he wants, he's got an excellent business head, and he delivers what he says he will," Gottlieb says. "He's a great programmer, one of the fastest programmers we've ever met and he's probably one of the highest paid in the country."

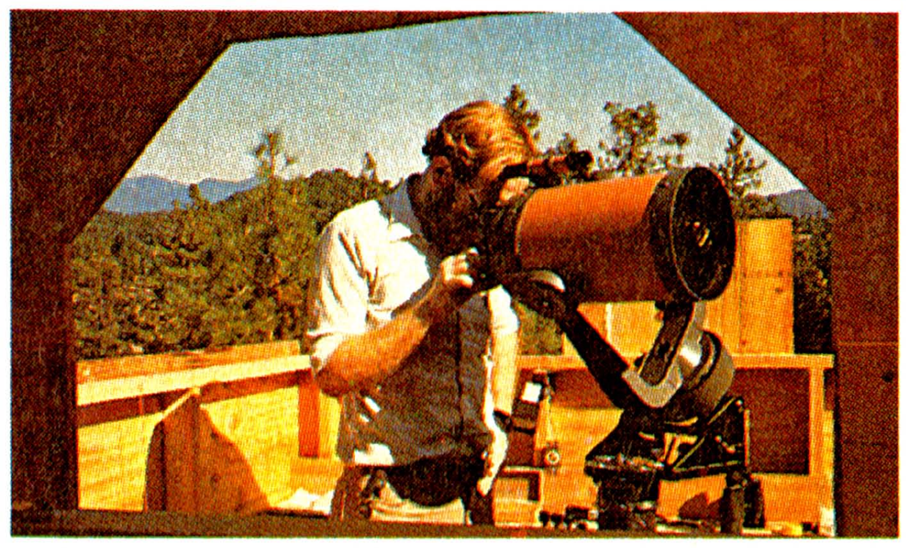
To hear Lutus tell it, the amount of money he makes is becoming an embarrassment for a man with such simple needs. "First, I got the idea in my head I could augment my NASA income with programming, and then I got the idea I could live solely on programming, and now I've got the idea if I make any more money, I'm going to go nuts."

How much does he make? While he prefers not to be specific, it's enough to make the tax collector his mortal enemy. In the past, he's sold programs for $7000 to $20,000. However, his income has increased enormously since he began retaining ownership and licensing programs on a royalty basis to the companies that distribute them. (Under a typical royalty arrangement, a programmer might get 25 percent of the wholesale price of the program.) The difference can be dramatic—on the most recent version of Apple Writer, Lutus figures to make more than a quarter of a million dollars under the royalty arrangement. He sold the original Apple Writer outright for $7500, but it went on to become one of Apple's best-selling programs.

Lutus's living expenses, on the other hand, are minuscule. Taxes on his property run about $100 a year and heating is free (he cuts his own firewood with a chain saw). "I buy gas for the airplane, which is quite expensive, but if I didn't do that, my expenses per year would be around $3000 or so—most of that for groceries."

Lutus's work routine is, as you might expect, not routine. Programming only a few months of the year, the rest of his time is spent traveling, flying, and hiking. When Lutus does program, he might work for a solid week at a time, typically from 8:00 a.m. to 1:00 a.m., with an occasional nap in the afternoon. He tries to do his creative work

in the morning, when he's fresh, and leaves the routine bug-checking to the afternoon or evening. Unlike computer textbooks that exhort programmers to start with a flowchart, Lutus writes very little down on paper. "I live in a quiet environment," he says. With little



A rustic, hand-built cabin on the edge of the wilderness, 400 miles north of San Francisco, houses programmer, computers, and the ever-essential musical instruments.

to distract him, he is able to visualize the logical program flow in his head. Occasionally, for a particularly complex program, he'll make a rough chart—what has to happen, where it should branch, and the like.

Lutus's unconventional approach to just about everything has its roots in an unhappy youth. Born and raised in San Jose, California, he didn't get along with his parents and, like many bright kids, didn't fit into the structured nature of a conventional school system. In the seventh grade, he mentally dropped out. "I was in grades after seventh because it was required of me to be there, but I was not really *there*," he says. "I was bringing books from home or from the library, staying as far in the back of the room as possible, reading whatever I was interested in (electronics, philosophy, psychology)."

He had a lot of interests then, but electronics really caught his fancy. He built an illegal ham station (150 watts of power that ruined his neighbors' television reception), made electronic gadgets in his garage, and fixed TV sets for a hobby. "I was being told I was a total failure and would end up digging ditches, but at the same time what I was doing was very joyful and it occurred to me I might keep doing that—building radios, designing gadgets, and so forth."

At 16, unable to cope with his problems at home or school, Lutus left both. A series of odd jobs followed in San Francisco: radio announcer (he got fired for playing classics on an easy listening station), TV repairman, and folksinger. In the mid-1960s, he drifted into the hippie and drug scene and shuttled between the east and west coasts, crossing the country six times by thumb, car, airplane, and bicycle.

Lutus began to come into his own in 1969 when a friend helped him get a job building custom electronic equipment at the Mt. Sinai Medical Center in New York. Similar jobs followed in New Jersey, Colorado, and on the west coast, where he worked for a subcontractor on NASA's space shuttle program.

At NASA, Lutus got his first taste of computers. Up to that point he had been working exclusively on hardware and circuit boards, becoming increasingly frustrated because it took so long to move an idea from his head to reality. He wrote several programs on a programmable Hewlett-Packard calculator (including the solar-system model used by the Viking Lander team) and then got his hands on a real computer, a NASA timeshared keyboard terminal. The system was primitive, but for Lutus it was an eye-opener. The computer, he realized, was a way to try out his ideas instantly. All of this, particularly the success of the solar-system model, brought the commercial possibilities to light. "Besides the ego boost, it piqued my curiosity about what kind of value these programs might have besides just being interesting."

Lutus was still mulling over computer programs when he decided to move to the country. Sick and tired of living in the city, he figured he could live on $40 a month and do some of the nonengineering things he had wanted to do since boyhood—live in the

woods, read a lot, and perhaps become a writer. Locating an 11-acre parcel in Oregon, Lutus built his first cabin (the one he lives in now is his third), and commuted to the Bay Area by commercial airplane to consult with NASA. He gradually let that wither away to tend to his other pursuits—publishing a collection of poems he had written during the previous 10 years, reading, and fooling around with electronic gadgets. But suddenly the computer bug caught up with him one night in the spring of 1977. He was reading *Scientific American* by the light of a kerosene lamp when he spotted an ad for the Apple II. It was all there: color, high-resolution graphics, the right price. He ordered one immediately and it was off to the races.

"Within two months, I had written some programs and sent them to Apple, and they were already encouraging me to write some more—and making noises like they would buy some." His first programs were written in BASIC because he didn't know how to write in assembly language. Then for about a year he devised a hybrid combination of BASIC and assembly language. "Musicomp is an example," he says. "It does all the ordinary things in BASIC like print text and accept inputs, but once it gets ready to play the music, it does that in assembly language."

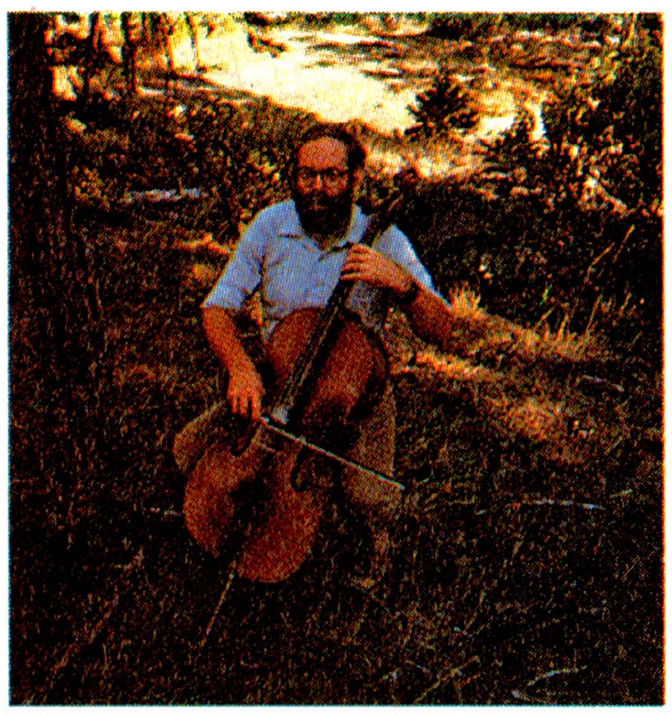
> Profit has been a convenient by-product of the things he wanted to do anyway.

A unique aspect of Lutus's approach is that virtually all the programs he's written have been either learning exercises for him or explorations of his interests. He almost never does the same thing twice. In fact, if you're tempted to call him up and propose an idea that will make both of you rich and famous, save your time and your dime; he'll hang up on you. "I've never responded to a specific request for a program because that would break my rule about it being interesting. If I didn't have the idea myself, I would be bored with it and I wouldn't do a very good job."

Musicomp was one of his good ideas. "Apple provided a little speaker that went 'beep' when you hit Reset. So I said, let's do something else with that." Lutus pulled duty cycling out of his bag of electronic tricks (a way of altering the sound by changing the shape of the speaker signal) to produce sound that is far more colorful than anyone expected from such a tiny speaker handling only a digital signal. Musicomp was a learning exercise to figure out how to make music on a computer with a speaker not designed for music. He went on to create Apple World, a three-dimensional drawing program, to help him lay out his cabin. Space Raiders

was a test of his new extension of the FORTH language. His interest in FORTH was the result of his desire to develop a more "humanized" language, superior to BASIC and Pascal—two microcomputer languages he considers "illiterate."

with computers and people. "I've spent a lot of energy trying to prevent a priest class from forming around computers," he says. "People believe that computers are magic and that people who understand them are also magic, and that's garbage. I demystify them. I talk about



Paul Lutus: electronics engineer, teacher, poet, musician, master computer programmer, and seventh-grade dropout.

how easy they are to work with." To Lutus, a computer is simply "a very dumb thing that responds to input from a human being's finger. There are attempts underway to create software systems that favor the specialist over the user, lots of them, in fact; some way will have to be found to get around that."

Lutus sums up his happy life in computers this way: "It's getting to the point now where precisely the thing that is the most interesting to me is also something that's likely to be profitable."

Expanding his vision beyond just writing programs, Lutus is preoccupied

His work in emphasizing the English language aspects of FORTH is just such an attempt; so is his choice of an Apple as a computer to write programs on. "If I program for an IBM business computer, how many people are going to use it? Will anything I do on that machine make a difference to the status of real computing? With more than 200,000 Apple IIs in the world (many of them in schools), if I do something that says 'come hither, this is a friendly environment,' that's going to make an enormous difference to the acceptance of computers. For me, that's important."

Also important is what he calls "computer activism," a term that means using a computer to augment your resources and help even up the sides when you've got a bone to pick with the establishment. Irritated by a speeding ticket he got a year and a half ago from a radar-wielding highway patrolman, Lutus looked up federal govern-

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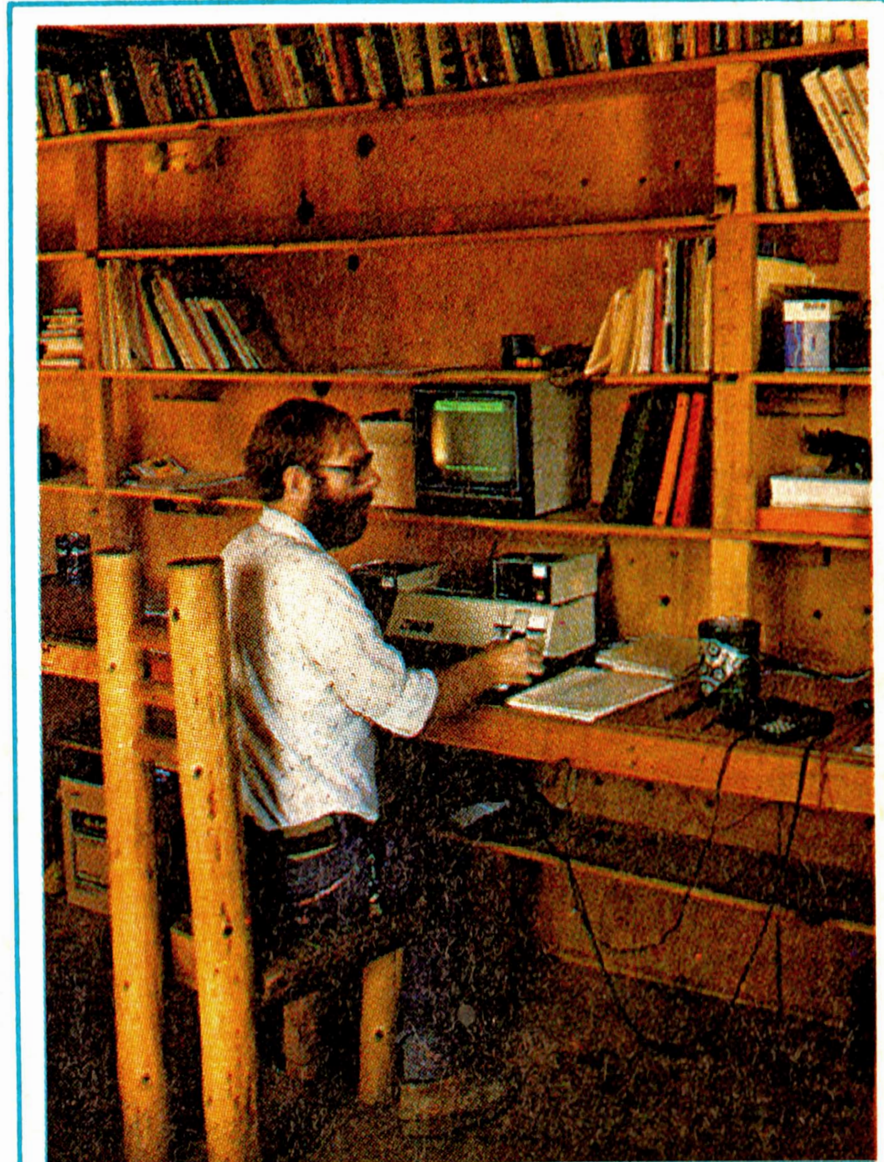
ment standards for permissible microwave radiation levels, wrote a model of it for traffic radars, and found them a health hazard by the government's own standards. It's an issue that is starting to snowball (Lutus recently wrote an article on it for *Mother Jones* magazine). He's also found that personal computers can move mountains—or prevent them from being moved. Not long ago, he joined with some neighbors to



The bookcase includes a slim volume of Lutus's own poems.

stop a mining company from strip-mining copper out of the Eight Dollar Mountain behind his cabin (a Lutus program double-checked the company's financial projections for the project and found they were inaccurate).

Watching Lutus at work and listening to him explain what he does, and why, is quite an experience. Articulate and well-spoken, even *he* sometimes can't keep up with the ideas churning in his head. He dashes from one machine to the other, shoving disks into the drives, throwing images on the screens to illustrate one point after another. Doing what few ever have the chance to do, Lutus is the consummate amateur in the truest sense of that word: a person who does something solely for the love of it. □

A. Richard Immel worked for the Wall Street Journal *for 10 years and is now a freelance writer living in San Francisco.*

The Hitachi MB-6890

A preview of Hitachi's plans for entry into the American micro marketplace.

by George Stewart

You've heard it before and you'll hear it again: "The Japanese build quality machines." The Hitachi MB-6890 reaffirms that claim.

Because of difficulties in meeting FCC requirements on radio-frequency emissions, Hitachi probably will *not* market the MB-6890 in the U.S. Instead, it will most likely introduce a redesigned unit in late 1982. However, the U.S. version will undoubtedly offer an array of features and capabilities quite similar to those of the MB-6890. Consequently, this article is a preview of things to come.

Hitachi's personal computer was introduced in Japan a couple of years ago and has achieved only moderate success there. Preparing for entry into the U.S. market, Hitachi has sweetened the pot by adding a new, powerful BASIC operating system from Microsoft. The result is a very impressive small computer. If (and this is a big if) the Hitachi Sales Corporation of America can back its computer with a first-class service and distribution network, the company could be a strong rival for Apple, Radio Shack, and IBM—especially at the high end of the market.

The MB-6890 is an attractively packaged system. The microprocessor and keyboard are housed in a single case which includes connections for a high-resolution monitor (color or monochrome), cassette, disk, light pen, printer, and future enhancements.

Its microprocessor is the 6809, the same one Radio Shack's Color Computer uses. That chip and others in its "support family" are well suited to high-speed graphics; in fact, graphics is one of the Hitachi's strong features. However, the distinguishing characteristic of the MB-6890 is its software orientation: almost every aspect of the computer can be modified, controlled, or used through software, often with simple BASIC statements.

Keyboard

The MB-6890 has a whopping 86 keys on the keyboard. Hitachi claims 87, probably because one of them has three positions. You can type in 281 different characters, including the uppercase and lowercase Roman alphabet, graphics symbols, and either of two Japanese character sets (katakana or hiragana). Whenever you press a key, an adjustable-volume tone generator beeps in confirmation (it's called aural feedback). Every key repeats if held down. When using a color

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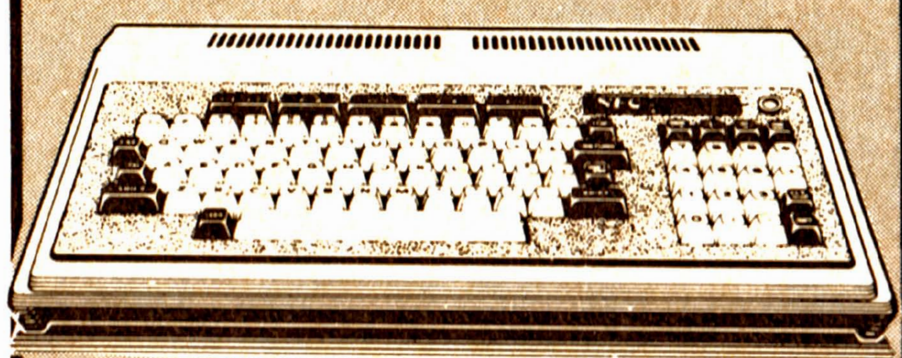

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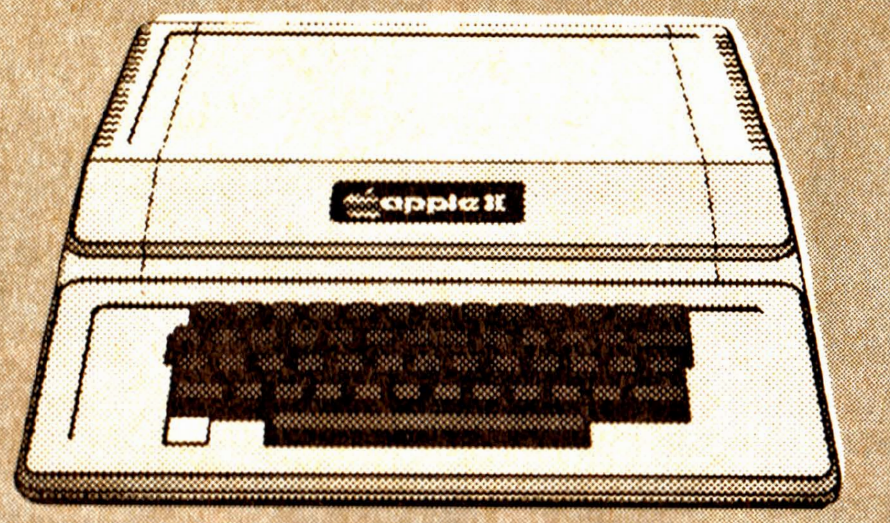

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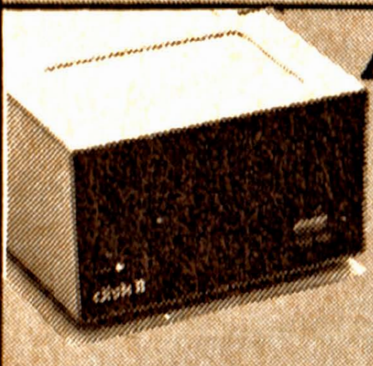

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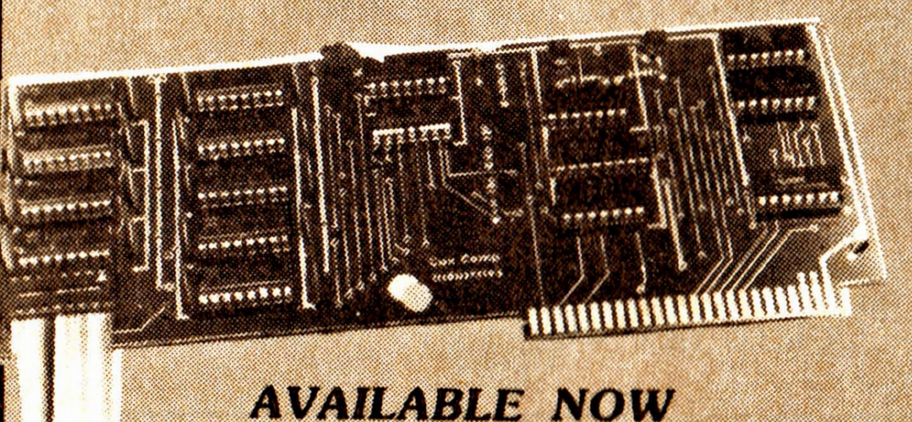

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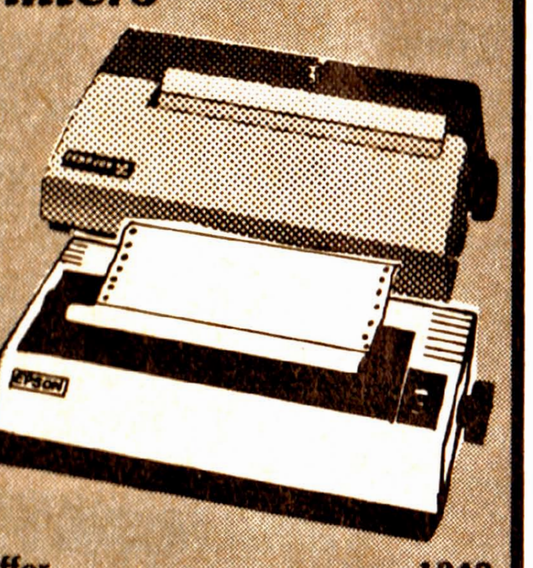

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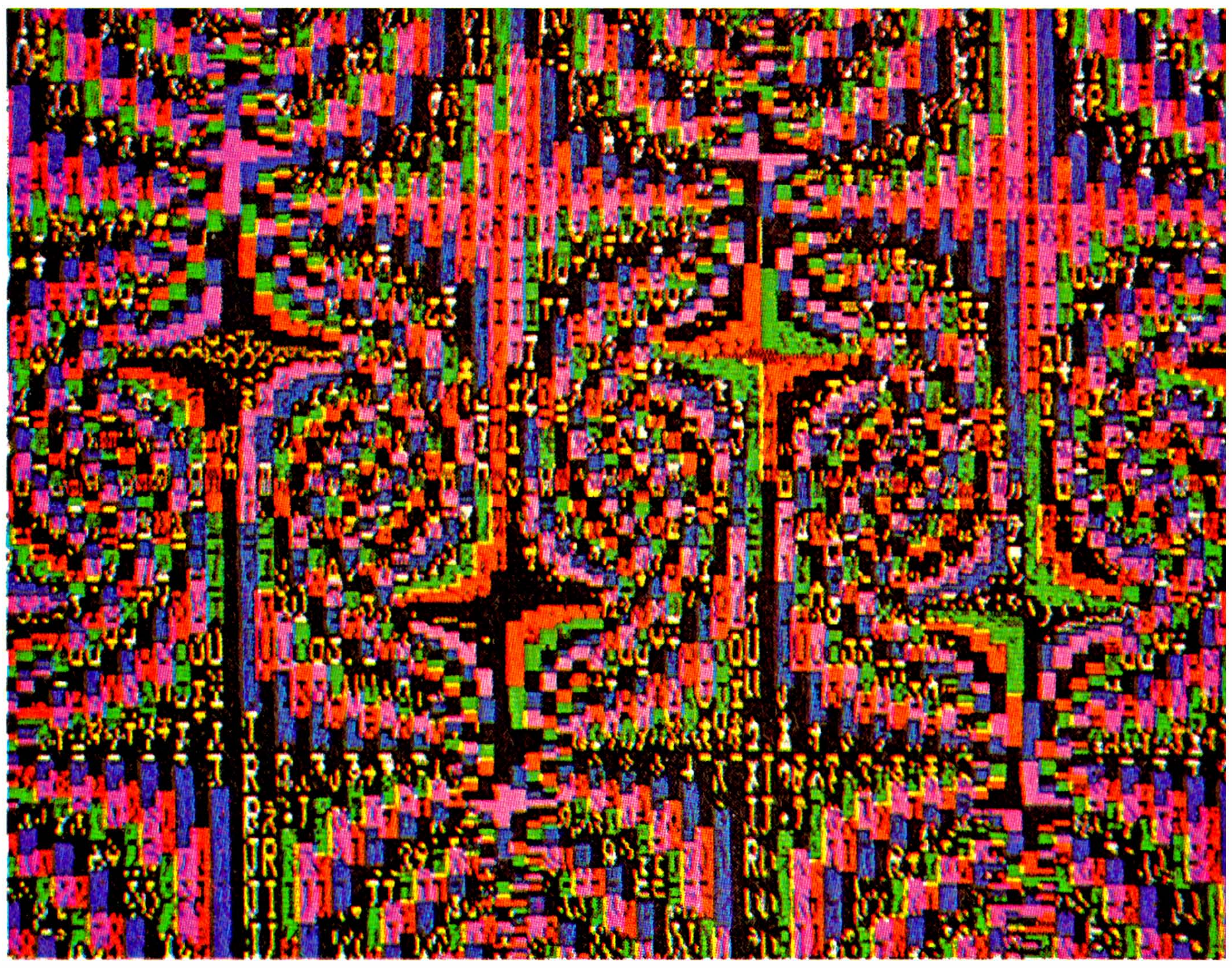

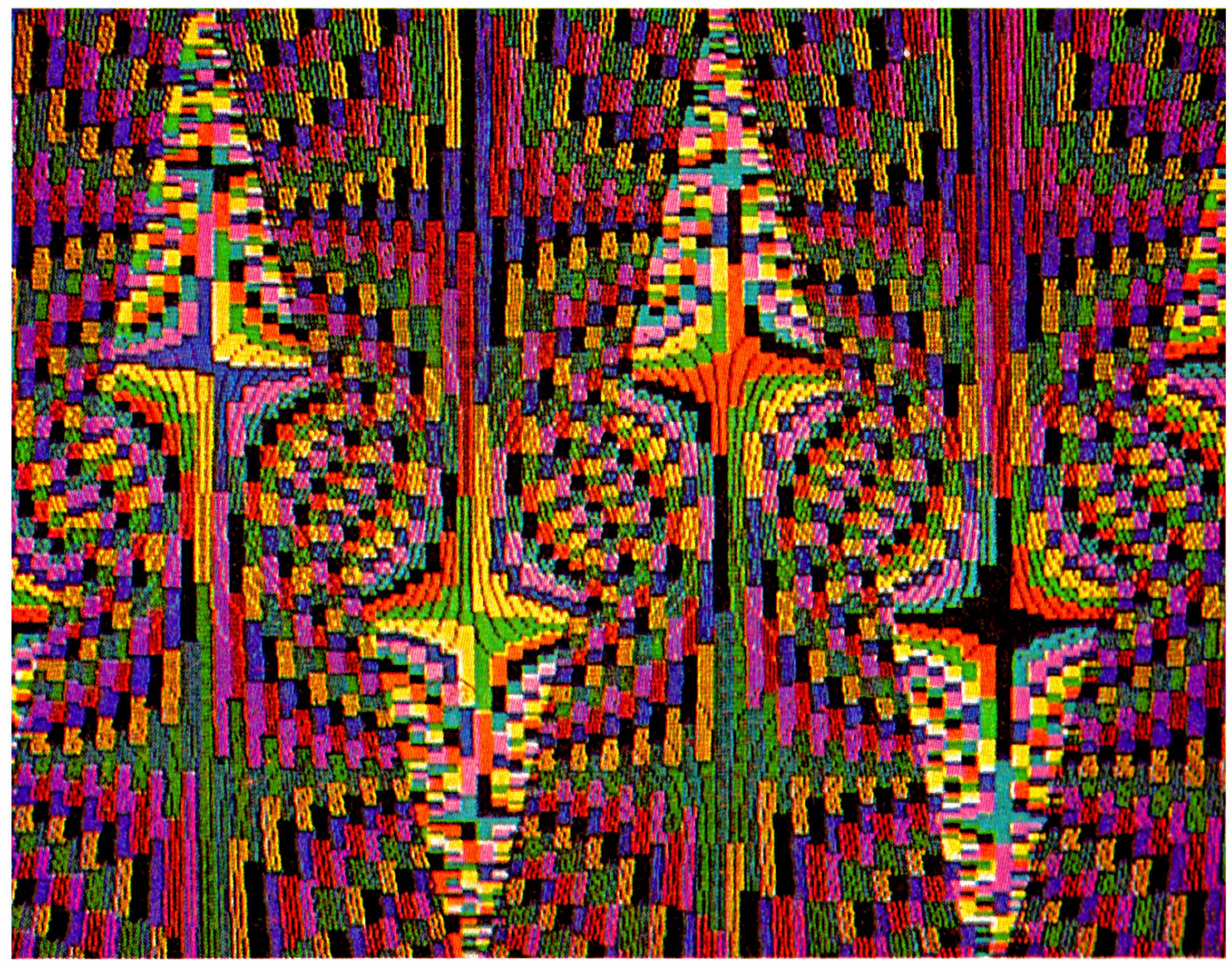

monitor, you can switch background colors simply by pressing a key—even while a program is running. A *keyahead buffer* lets you type while the computer is busy doing something else (such as writing information to the disk); when the computer finishes its task, it will display the characters you typed. The keyahead buffer holds up to 31 keystrokes. This unusual capability reduces annoying "dead states" during continuous data entry.

The keyboard features five programmable function (PF) keys that reduce repetitive typing of commands and data. Pressing one of these keys generates a whole sequence of characters or *keyphrase*. For example, pressing the PF4 key is the same as typing LIST and pressing Enter. Pressing PF2 is equivalent to typing PRINT "DATE$, TIME$" and Enter to request the time and date (yes, a real-time clock is standard). Pressing Shift with any of the five PF keys generates a second keyphrase—yielding a total of ten. Best of all, every one of the PF keys can be reprogrammed for your convenience.

Display

Hitachi monitors are fast establishing industry standards for quality. Images are sharp, and the colors are extremely bright. When connected to one of these high-resolution color monitors, the Hitachi personal computer can project truly artful displays with resolution up to 640 by 200 dots. More than 50 special graphics characters, including geometric shapes, grids, and the four playing-card suits, add to the numerous visual possibilities.

Many of the display's characteristics are programmable:

- independent foreground and background colors
- characters per line (40 or 80)
- resolution (high or low)
- scroll window (the section of the screen used during ordinary video output)
- light-pen selection squares for easy programming of the light pen as an input device

You can even display a key-definition line at the bottom of the screen to indicate functions currently assigned to the PF keys.

Screen Editor

The MB-6890 includes a true *screen editor*. It's an important feature involving the keyboard and display, and it merits some explaining. A screen editor, as opposed to the more common BASIC line editors, lets you edit and use text that appears anywhere on the screen—not just on the current line. For example, if you want to reenter a complicated command a few lines up from your current position, simply move the cursor up to that line, make any changes you desire, then press Enter. It's as if you'd retyped the entire line.

You're not limited to merely moving

At a Glance

Name: Hitachi MB-6890

Uses

Personal computing, small businesses, professional firms, schools and universities, scientific institutions, and homes

Standard Features

6809 microprocessor; keyboard: 87-key, typewriter-style; display: 40 or 80 characters by 25 lines of text, 640 by 200 graphics resolution, 281 displayable characters and graphic symbols, seven colors; memory: 24 K bytes of read-only memory (ROM) containing BASIC, data-terminal, and monitor software, 32 K bytes of random access memory (RAM); tone generator; real-time clock; interfaces for cassette, color monitor, monochrome monitor, parallel printer, light pen, and RS-232C devices; six expansion slots; power supply and AC line cord

Manufacturer

Hitachi Corporation (Japan)
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Base List Price

$1,050 for keyboard unit only; monitor disk unit, light pen, printer, and cassette recorder options extra

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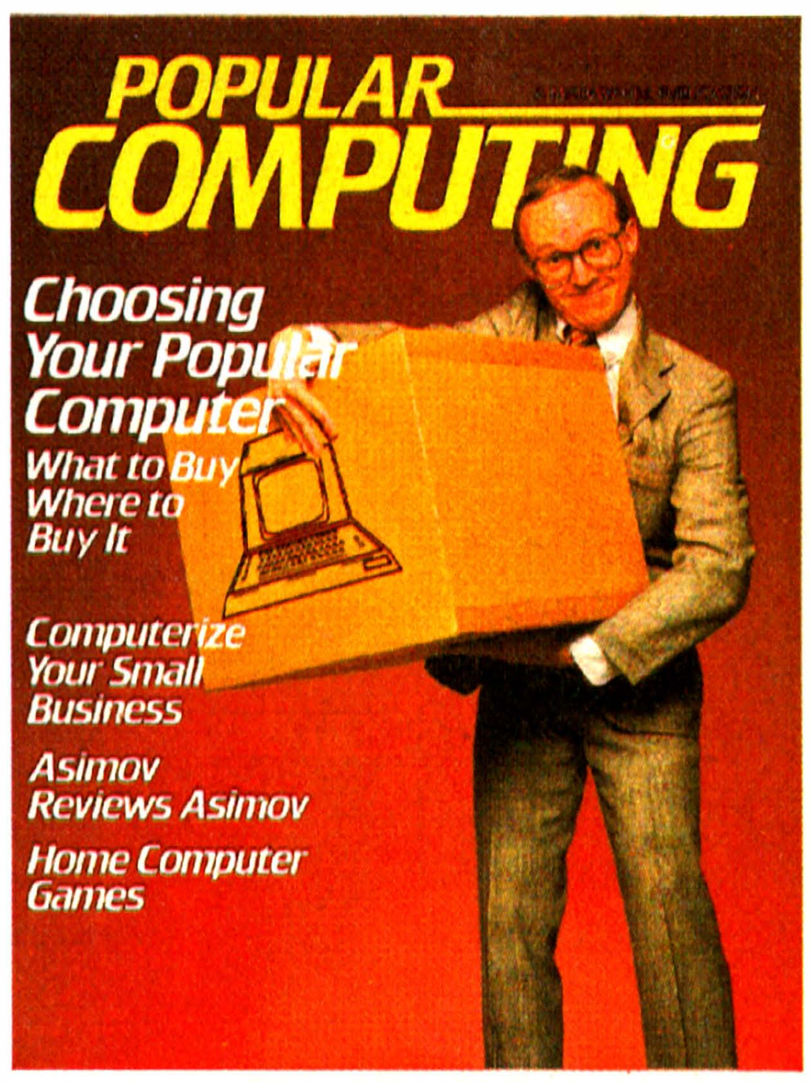

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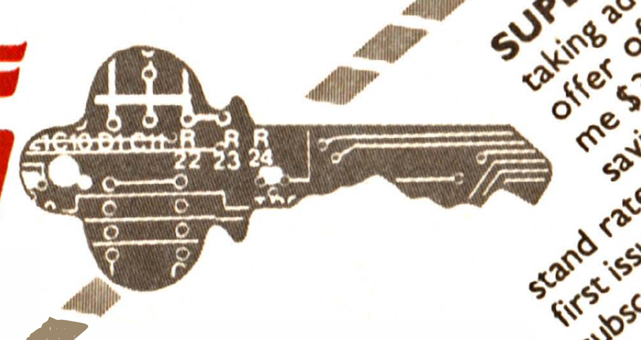

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the cursor around. Using special control keys, you can perform many of the essential editing functions of word processors: inserting or deleting characters, setting tabs, tabbing forward or backward, even skipping forward or backward to the next or previous word boundary.

Level III BASIC

The computer includes an extended form of BASIC written by Microsoft. Both cassette and disk versions are more powerful than the usual Microsoft BASIC. The color-graphics commands are especially impressive. PSET lights any graphics point on the screen. LINE draws a line between any two points; it can also draw solid or empty boxes. PAINT colors any region, stopping on boundaries you set up with PSET or LINE. (These commands are also available in the Radio Shack Color Computer Extended BASIC—no surprise since Microsoft wrote that BASIC too.) The cassette system for program and data storage is versatile but somewhat slow (600 bits per second).

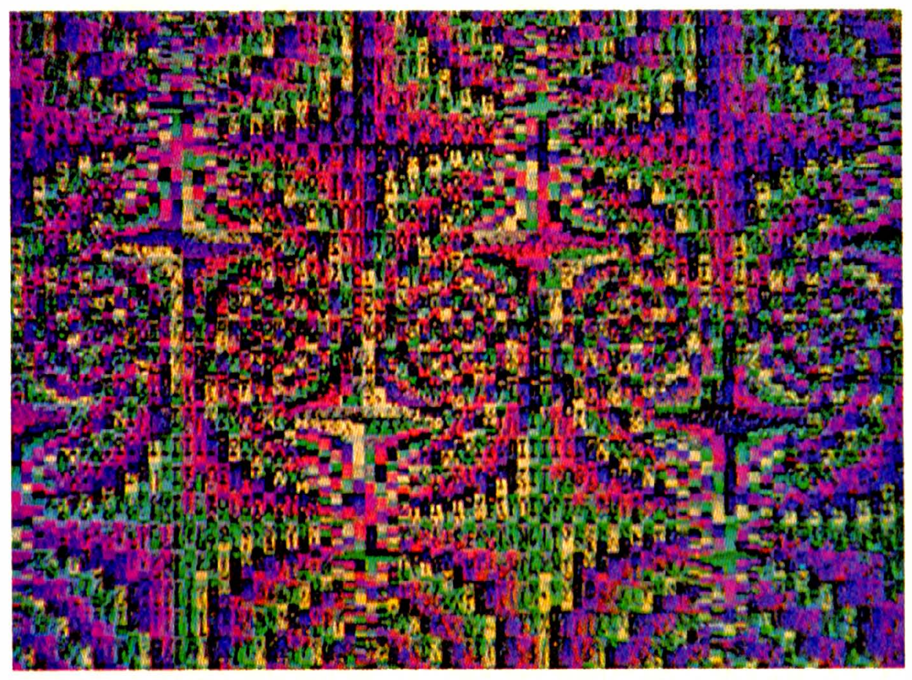
Disk System

Up to four single-density 5¼-inch floppy-disk drives may be connected to the MB-6890. The use of single-density is a disappointment since double-density is becoming widespread (TRS-80 Model III and Apple II have it).

The disk system is unusual because it has no DOS (disk operating system) command interpreter; all commands are entered from the BASIC interpreter. For example, to initialize a data disk, you use the BASIC command RUN "FORMAT". Hitachi has, in effect, eliminated the need to switch modes from BASIC to DOS and back. This seems good for the beginning user but may prove to be less flexible for the advanced programmer.

Communications Features

Data terminal programs allow a computer to communicate with a host computer. Communication is usually via telephone lines and requires an RS-232C interface and a modem. The MB-6890 includes a data terminal program *and* an RS-232C interface. Add a modem and you're ready to link up with Compuserve, The Source, or any other telecommunications service.



Features for Programmers

The MB-6890 has many other features to ease the programmer's job. *Interrupt handling* is one example with obvious benefits. Interrupts allow an external device (keyboard, light pen, or RS-232C device) to get the computer's attention, even though the computer is occupied with some other task. Most interrupts require some sort of service from the computer, after which the computer is free to continue with the interrupted task. The programming that makes this possible is usually extremely complex and is done on an assembly-language level. Not so with the MB-6890. A set of BASIC commands will handle many kinds of interrupts quite simply.

Using the ON COM statement, you can program the computer to recognize and respond to an interrupt from the RS-232C interface (for instance, when a message comes in on your remote communications line). Using the ON PEN statement, you can program the computer to respond instantly when the light pen is applied to the computer display. ON KEY works similarly with interrupts from the keyboard. The net effect of all these interrupt-handling capabilities is to make the MB-6890 an especially interactive machine.

Device independence is another useful attribute of the MB-6890 system. It means that many input/output (I/O) routines can be written without respect to any particular I/O device. Output to the RS-232C interface, for example, can usually be handled in the same manner as output to the video display; keyboard input routines can easily be replaced by routines to input characters from a disk file without major changes in the program's logic. Whether you write programs or just use them, the Hitachi's device-independent I/O should make the system quite flexible for you.

In addition to the BASIC interpreter and data-terminal program, the MB-6890 includes a simple machine-language monitor program. This allows advanced programmers to examine and change the contents of memory or the microprocessor's registers and to execute machine-language programs.

The Big Question

The MB-6890 looks like a great machine. Now the question is, can Hitachi successfully market a U.S. counterpart? The unit will definitely be out of the impulse-buying price range and therefore will have to be sold intelligently and supported with convenient service. A product manager for Hitachi says several marketing outlets are under consideration, with Hitachi audio dealers included among the usual computer store outlets. Hitachi must also provide applications software—word processing and business programs, for example. The product manager states that Hitachi will probably lend equipment to programming firms to speed the development of a good base of such software. That idea is certain to go over well—programmers are going to love Hitachi's software-oriented design! □

George Stewart is senior technical editor for Popular Computing.

Photos by Paul Avis

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3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
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69 TIMEMOV	Time series analysis moving average trend
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73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
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What Language Is Best for You?

by William Barden, Jr.

BASIC is the universal language of the microcomputer world. It has become so much a part of computers that one pictures Remington Rand engineers keying in BASIC test programs for the Univac I back in the 1950s. But BASIC wasn't always around, even though it's hard to imagine an Apple, PET, TRS-80, or IBM small computer without BASIC as the primary language. How did BASIC gain such a foothold in personal computers? Is it really as simple as represented? What other languages can be used with your computing system? Should they be used in place of BASIC?

In this article, I'll attempt to answer those questions, give a brief history of computer languages, and discuss the popular microcomputer languages.

Background

Microcomputer *hardware* is remarkably similar to the earliest digital computers. (Lest I be tarred and feathered with computer printouts, let me hastily acknowledge the contributions of computer-design engineers. They have taken giant steps in reducing what used to fill rooms to a postage-stamp-sized chip. They've cut hardware cost and increased reliability by a factor of 1000.)

However, if you look at computer *instruction sets*, you'll find the same things are accomplished by the Z80 microprocessor in a TRS-80 or the 6502 chip in the Apple or PET as were accomplished in the logic components of the Ferranti Mark I that Alan Turing programmed back in the 1950s. You'll find instructions to add two numbers, to load an accumulator from memory, or to store an accumulator to memory. The most complex task your personal computer can take on is to multiply two numbers or search a list of numbers for a given number.

Every program, from VisiCalc to Adventure, ultimately boils down to the execution of thousands of rudimentary *machine-language* instructions. To be very unkind, today's computers (in fact, all digital computers) are not much more than extremely fast adding machines or calculators with the ability to store data and instructions and to change the sequence of instructions.

Machine Language

Initially, digital computers were developed to solve *number-crunching* problems rapidly—such things as planning artillery trajectories, simulating flight patterns, and breaking codes. The instruction sets of the early computers traditionally reflected this arithmetic processing bias.

The most basic computer language consists of *binary* ones and zeroes, which make up the *operating codes* that instruct the microprocessor. Let's look at how it works. Suppose we want to add the numbers from 1 to 100. In Z80 machine language (S-100 systems, TRS-80 Models I, II, and III, Apple Softcard, North Star, and others), we'd use the program shown in listing 1.

The program consists of the five machine-language instructions on the left. Each command is represented in binary ones and zeroes, the way it appears in the microcomputer's memory. Of course, the programmer of bygone days didn't just sit down and write out strings of ones and zeroes. He listed instructions from the instruction set of the machine (shown on the right-hand portion of the list) and then *translated* them into machine-language codes. In doing so he had to check a table of codes for the machine.

This became extremely tedious. Since many instructions reference other instructions in memory, inserting or deleting instructions required laborious hand-written translation of large portions of the program. For this reason, *assembly language* was developed early in the computer game.

Binary Machine Language			Step	Instruction
00100001	00000000	00000000	1	Load total register with 0
00000001	00000000	01100100	2	Load current number register with 100
00001001			3	Add current number register to total register
00010101			4	Subtract 1 from current number register
00100000	11111100		5	If current number register not 0, back to 3

Listing 1: Machine-language program to add the numbers from 1 to 100.

Assembly Language

Assembly language uses symbols to represent machine-language instructions. Instead of writing "load the total register with 0" and then manually converting this instruction to its binary form of 00100001 00000000 00000000, the programmer writes "LD HL,0". An assembler program takes this symbolic instruction and converts it to a machine code of ones and zeroes. The same program used in listing 1 to add the numbers from 1 to 100 is shown in assembly language in listing 2.

Assembly language is much more readable and efficient than machine language. The computer does most of the tedious work, freeing the programmer to concentrate on the design of the program. (A side note: The *first* assembler program for a machine usually must be written in machine language since there is no assembler to assemble the assembler program. The only way to avoid this is to *cross assemble*, which is to assemble a program for one microprocessor on another system.)

Enter FORTRAN

Assembly language made programming easier for early computer users. Computers, however, were still only usable by computer scientists, who were familiar with instruction sets and felt comfortable with binary ones and zeroes.

FORTRAN (FORmula TRANSlation), developed by IBM in the late 1950s, increased the number of computer users. Instead of the one-for-one translation of symbolic instructions into machine language, FORTRAN took a mathematical formula and translated it into machine-language code *sets*. This translation was called *compiling*. With the advent of FORTRAN, the engineer or scientist who was *not* already involved with computers could use a computer to solve sophisticated mathematical problems. The programming problem we've been using as a sample is shown in FORTRAN in listing 3.

Using assembly language was less tedious than machine-language programming. The FORTRAN compiler was even easier. (For this reason, compiler languages are called high-level languages.) The FORTRAN statements, while not English, at least resembled mathematical formulas, and engineers and scientists could learn the language without becoming totally familiar with the computer system.

COBOL

In 1952, a Remington Rand Univac Model I got national exposure for tabulating projections during the presidential election. The potential for computers for business data processing was publicized by Remington-Rand and other computer companies. A major impediment to the use of computers in business was the necessary translation of accounting processes into a form that the computer system could understand. COBOL (COmmon Business-Oriented Language) made the translation more convenient.

COBOL was developed around 1960, specifically for business use. Like FORTRAN, it was originally a compiler, a translator that would take COBOL functions and convert them to machine-language instructions.

COBOL was more like English than other computer languages. In fact, it was presented as a language that would enable managers to do their own programming. Listing 4 shows the program we've been discussing in COBOL. It is an unfair comparison since COBOL is least efficient in number crunching.

```
Symbolic Instructions          Remarks

        LD    HL,0             ;LOAD TOTAL WITH 0
        LD    BC,100           ;LOAD CURRENT WITH 100
LOOP    ADD   HL,BC            ;ADD CURRENT TO TOTAL
        DEC   C                ;CURRENT-1 TO CURRENT
        JR    NZ,LOOP          ;GO IF CURRENT NOT 0
```

Listing 2: Assembly-language program to add the numbers from 1 to 100.

Other Languages in the 1960s

FORTRAN and COBOL remain two of the most popular and permanent languages for all computers. Many other languages were also developed in this period as the number of computer manufacturers and users increased. ALGOL (ALGOrithmic Language) was formulated about 1960, primarily for mathematical processing. Used by computer scientists, ALGOL is similar to FORTRAN and was promoted by the Association for Computing Machinery (ACM). LISP (LISt Processing language) was also developed in the early 1960s to facilitate the processing of data in the form of lists. It remains a popular language among devotees of artificial intelligence.

```
      TOTAL = 0.
      DO 20 I = 1, 100
20    TOTAL = TOTAL + I
```

Listing 3: FORTRAN program to add the numbers from 1 to 100.

PL/I (Programming Language I) was invented in the late 1960s by IBM to replace FORTRAN and COBOL. Although acceptable for large-scale data-processing applications, it could hardly be called a success.

The list of other languages that achieved limited acceptance is enormous. This was the era of the language acronym, as evidenced by JOVIAL (Jules' Own Version of an International Algebraic Language), BOMP (Bill Of Materials Processor), and many others.

During the late sixties and early seventies, two trends dovetailed to make BASIC (or something like it) inevitable. First was the trend toward smaller, less expensive computers. These *minicomputers*, and later, *microcomputers*, put data-processing power in the hands of people who were untrained in computer science. A second, related trend was the growing popularity of computers in general.

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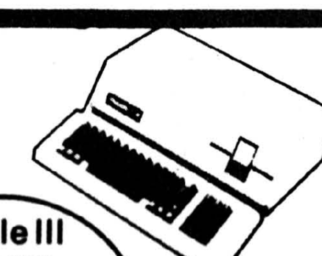

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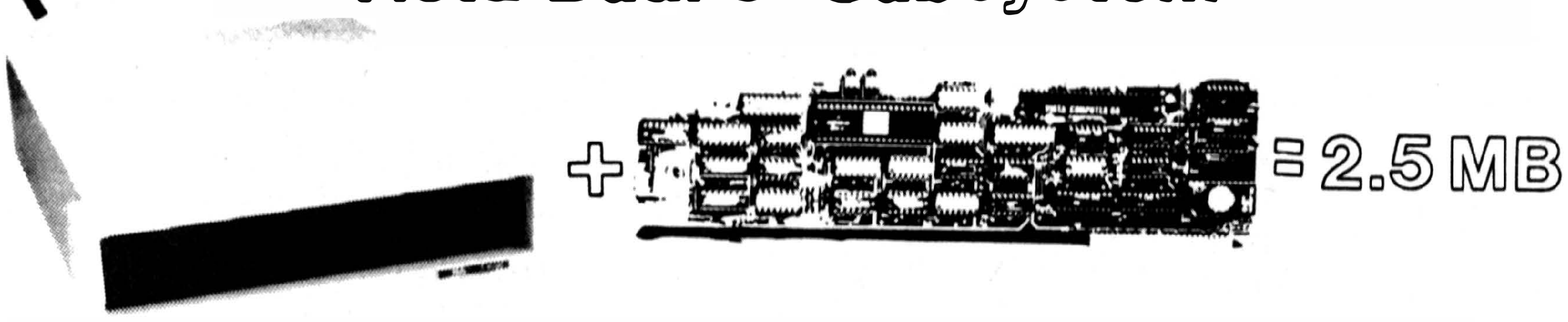

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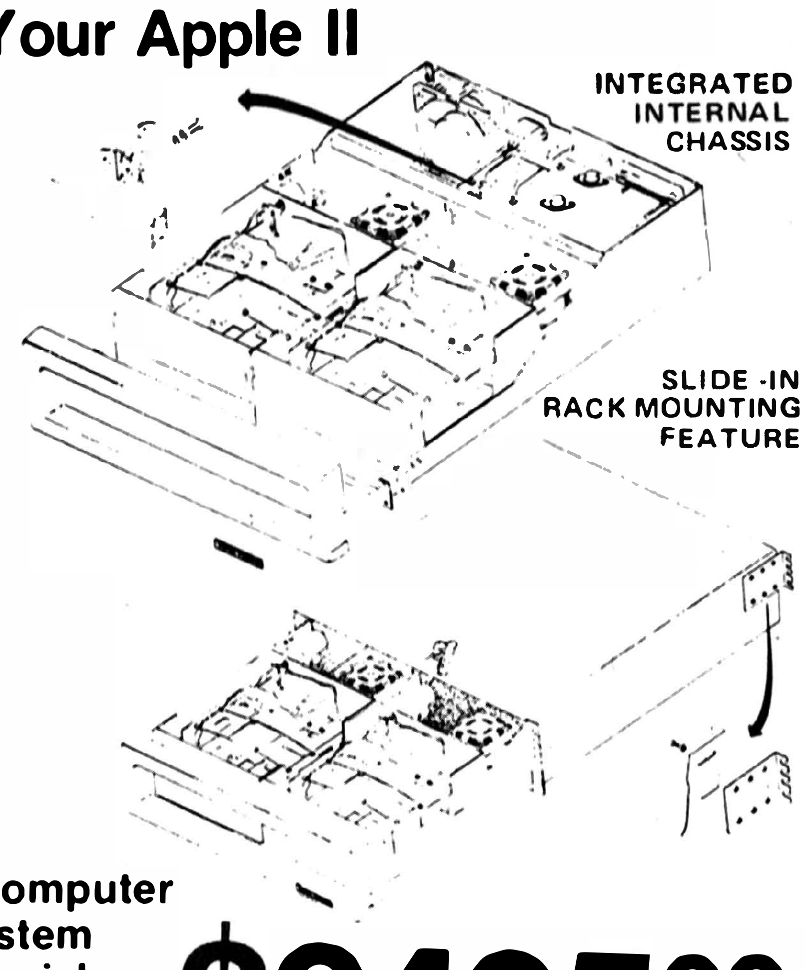

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```
130 PROCEDURE DIVISION
135 PGM-BEGIN. MOVE ZEROES TO TOTAL-COUNT, INC.
140 LOOP. IF INC IS GREATER THAN 100
150             GO TO PGM-END.
160       ADD 1 TO INC.
170       ADD INC TO TOTAL-COUNT.
180       GO TO LOOP.
190 PGM-END. STOP RUN.
```

Listing 4: COBOL program to add the numbers from 1 to 100.

Both encouraged the development of an easy-to-use programming language.

BASIC

Developed by John Kemeny and Thomas Kurtz at Dartmouth College, BASIC was originally intended for use by computer-science students. The acronym BASIC stands for Beginner's All-purpose Symbolic Instruction Code, and indeed the language is more English-like than most previous languages; it is also simple to use.

The BASIC developed for the first microcomputer (the Altair) was written by Bill Gates, now a principal in the Microsoft company. In contrast to most earlier high-level languages, it was *interpreted* rather than *compiled*. Interpreters read in the language text and do some preliminary processing but largely reprocess the text in each line every time the program is run. Compilers, on the other hand, convert statements into compact, machine-language form.

Each has advantages and disadvantages. In general, a compiler is best suited for programs that must run at fast speeds or for developing programs on a large system shared by many programmers. An interpreter, on the other hand, runs 10 or 20 times more slowly than a compiler, but is very *interactive* (good communication between user and machine).

Altair BASIC changed the Altair from an awkward machine that could run only hand-assembled machine-language programs into a truly useful product. Microsoft soon produced BASIC interpreters for other microcomputer manufacturers, many of which were created in the wake of the Altair's success.

Microsoft BASIC has since become the de facto standard for BASIC interpreters and the standard high-level personal-computer language. With minor differences, a program written in Microsoft BASIC looks the same, regardless of the computer it's written for. Listing 5 shows the sample program in Microsoft BASIC.

Other Languages

Most personal computers offer a BASIC interpreter which is perman-

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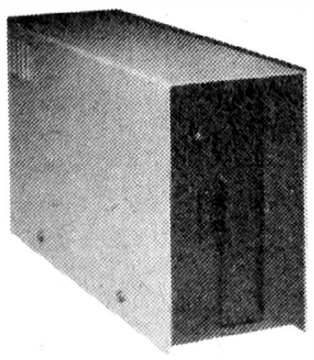

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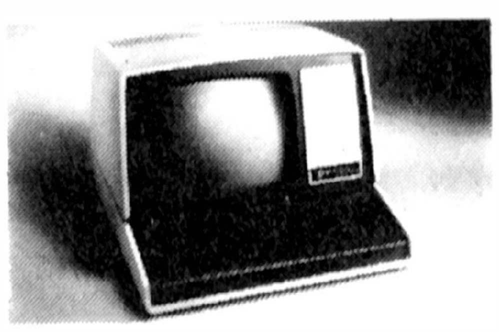

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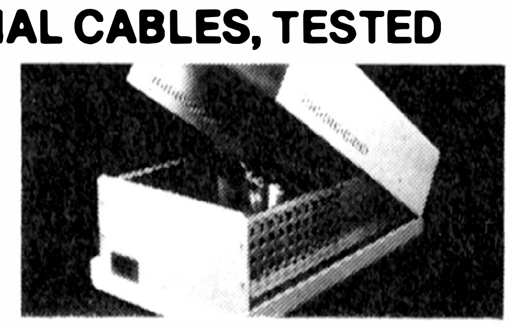

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```
100  T = 0
110  FOR I = 1 TO 100
120  T = T + I
130  NEXT I
```

Listing 5: BASIC program to add the numbers from 1 to 100.

```
BEGIN
FOR  I: = 1 TO 100 DO
        BEGIN
          TOTAL: = TOTAL + I;
        END;
END.
```

Listing 6: Pascal program to add the numbers from 1 to 100.

ently stored in ROM (read-only memory). Some offer the tried and true FORTRAN and COBOL, because many users are already familiar with these languages.

Other languages are challenging BASIC, FORTRAN, and COBOL, however. One is Pascal, developed in 1970 in Europe and adapted to microcomputers by the University of California, San Diego. Pascal has attracted a wide following and it is being taught in many universities. Though not as popular as BASIC, Pascal will probably be widely used for some time. Listing 6 shows our sample program in Pascal.

FORTH (an unusually versatile but difficult interpretive language), PL/M (a version of PL/I for microcomputers), C (used on the new Unix operating system), and PILOT (even easier to learn than BASIC) have also gained followings.

Which Language Is Best?

Machine language is best for short code segments embedded in BASIC or other high-level languages. Anything done in machine language can generally be accomplished much more easily in assembly language.

Assembly language should be used over machine language to automatically assemble machine-language code. However, it is difficult to learn and tedious to use. Developing programs takes 5 to 20 times as long as the equivalent program developed in BASIC or another language. On the plus side, a lot of significant software (word processors, high-speed games, data-management programs) is written in assembly language. It is hundreds of times faster than an interpretive language and 5 to 20 times faster than a compiler language.

Interpretive BASIC is the stock BASIC one gets in ROM or as a standard BASIC. Interpretive BASICs are easy to learn, offer great flexibility, and are very interactive. One can enter a program, execute it, pause, examine values and results, edit, run the program again, and repeat the process forever. Interpretive BASICs are ideal tools for writing programs and numerous programs exist for BASIC. One drawback is its low speed when

compared to compiler BASIC. This is a good language for beginners.

Compiler BASIC generally offers the same functions and capabilities as interpretive BASIC. However, compiler BASICs are not interactive. Programs must be compiled in their entirety, debugged, and then recompiled. In many cases, compiler BASIC occupies inordinate amounts of disk storage for a small system. On the plus side, a compiled BASIC program will run faster than its equivalent interpretive BASIC program. Compiler BASIC is also available on many personal computers.

FORTRAN is a workhorse for engineers and scientists and is excellent for solving engineering problems. Microcomputer versions are compilers and tend to use a great deal of disk storage. Note: Unless you have already programmed in FORTRAN or have FORTRAN programs, use Pascal.

COBOL is probably the most widely used large-system language. Again, a microcomputer COBOL compiler tends to eat up disk and memory storage. Many business functions can be accomplished in BASIC in lieu of COBOL. Use it only if you have COBOL experience or COBOL programs.

Pascal generally uses a lot of memory and disk storage, unless you have a "tiny" version which is somewhat limited in processing capability. Pascal is very flexible and is excellent for engineering and scientific applications. The existing base of programs is growing, but is not yet as large as that for BASIC. Pascal is harder to learn than BASIC, but once it is learned it offers rapid program development. It is also less interactive than BASIC. Learn BASIC first, then try Pascal.

FORTH is an elegant, fast, and flexible language, but because it is rather abstract, I don't recommend it for beginners. LISP is occasionally available, but is also difficult to learn.

Although I haven't investigated every personal computer language in detail, I suggest trying BASIC first, and then experimenting with other languages until you find the one that best suits your needs. □

A Beginner's Guide to BASIC Programming

Part 1

Tired of canned programs? Here's how to write your own.

by Elizabeth Hughes

Soon after you buy a computer, you begin to discover the advantages of knowing something about programming. For example, suppose a program you have laboriously entered by hand from a printed listing doesn't work. Then what? Did you enter it wrong? Is there a typographical error in the listing? Or is it something more serious? If you know a little about programming, you often can identify and fix the problem. But if the commands are just gibberish to you, you don't have a chance.

The predominant language of personal computing is BASIC (Beginners' All-purpose Symbolic Instruction Code), which was developed for use in teaching programming. When personal computers first became available, there was no formal standard for implementations of BASIC. As a result, different versions of BASIC were developed for different computer systems. A familiarity with one version, however, will help you to recognize and make allowances for differences in other versions. Learn your computer's BASIC and you will know what your system can and cannot accept as instructions. The fundamentals rarely differ, so a knowledge of one version of BASIC will let you use other versions with comparative ease.

This article introduces you to some of the essential elements of programming in BASIC. Once you know the fundamentals, you can expand your familiarity with the language and move fairly easily into more advanced programming in BASIC and in other languages.

What Is a Program?

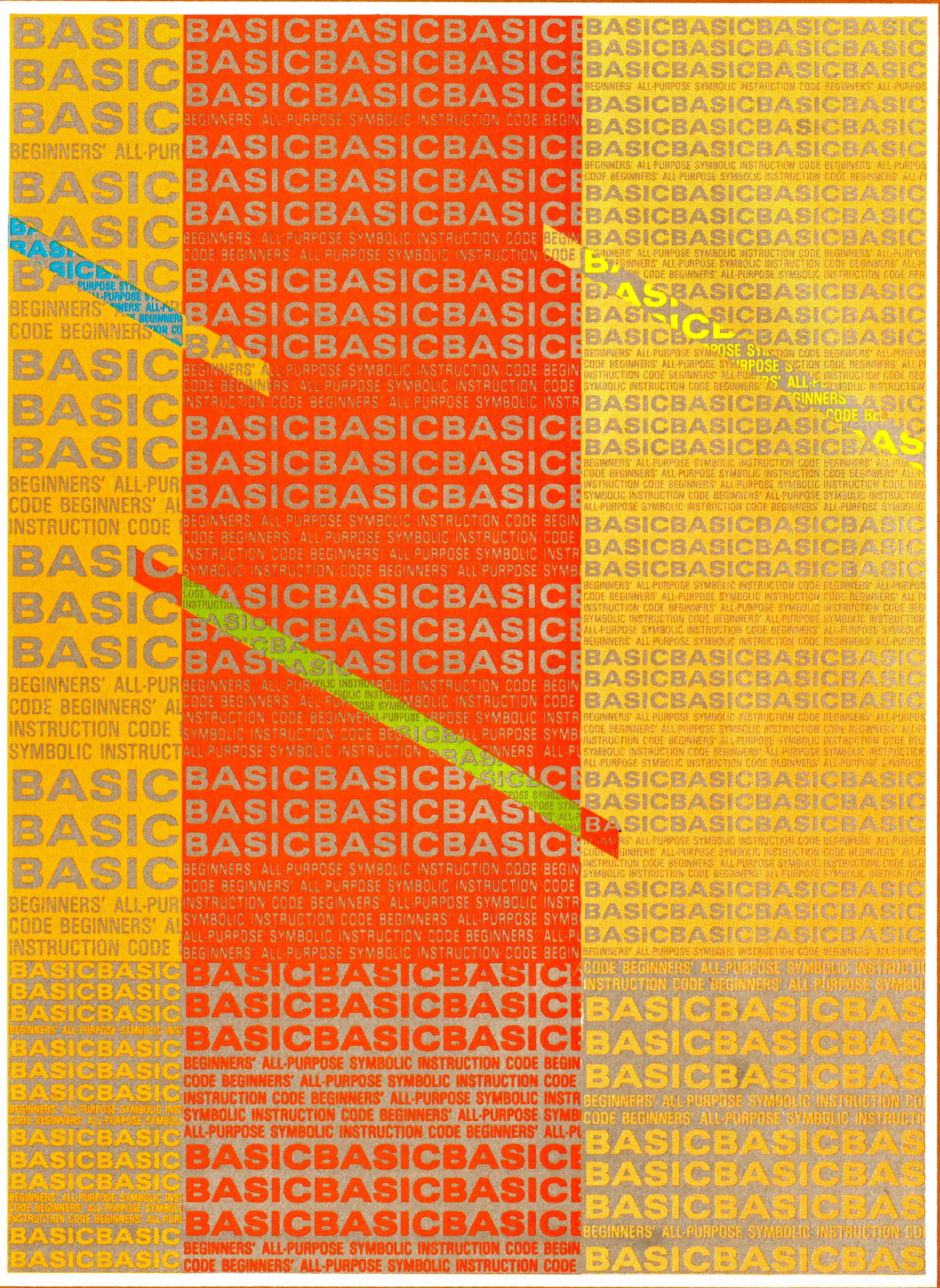
A program is the set of instructions you give a computer to tell it how to do what you want done. Most people choose to give these instructions in what is called a *high-level language*, such as BASIC, since these languages are easier to understand and simpler to use than *machine language*, the computer's native language. A program previously stored in the computer's memory converts the instructions you enter into a form the computer can use. Programs of this sort (called *compilers* or *interpreters*, depending on how they go about making the conversion) are what allow you to use high-level languages.

A program has four general parts: *initialization*, *body*, *output*, and *conclusion*. During initialization, variables and constants that the program will use are defined and assigned starting values. The actual data processing is done during the body, the computation stage. The program gets its data from an outside source (such as you, the user), performs the necessary mathematical and logical operations, and makes any decisions dictated by the program. During output, the computer presents the results in some convenient form: it either displays them on a video screen or sends them to a printer for hard copy. The conclusion terminates the program.

Let's consider an example. Suppose you want to figure a student's grade-point average using the familiar scale of A=4, B=3, C=2, D=1, and F=0. First you must multiply the number of credit hours for each course by the point value of the letter grade received and add the results together to get the total points. Then the grade-point average is the quotient of the total points divided by the total number of credit hours. Variables are needed to represent the number of credit hours for a course, the total hours, the total points, and the computed average. In the body of the program, the computer needs data about credit hours and grades earned, and it must operate on this data to produce the desired result. Then the result must be output in a usable form (printed or displayed on the screen), and the program must end.

Plan Your Program

The program we're discussing is fairly simple. Advance planning, however, can make any program more efficient and prevent necessary commands from being left out. Essential to the myriad approaches to program planning is a thorough understanding of the task to be performed. Computers don't have experience and cannot fill gaps in your instructions. Every aspect of a program's operation must be spelled out, which means you must think


BASIC
BEGINNERS' ALL-PURPOSE SYMBOLIC INSTRUCTION CODE

about what you want done in much more detail than you normally would. Things that can be assumed when speaking with another person can no longer be taken for granted when giving instructions to a computer. It will do exactly what you tell it and nothing more.

One important consideration in planning a program is the complexity of the operations. If the results of several sets of calculations are needed in order to develop the final result, it's advisable to break the program into *modules.* A module might be described as a subprogram. It handles one limited phase of a program's operation and is effectively separate from the rest of the program. In a game program, for example, there might be separate modules for displaying the gameboard, accepting and calculating the result of the player's moves, calculating the computer's moves, outputting instructions and comments, and determining the winner and loser, as well as the customary initialization and conclusion sections. The main program would call each module into use as needed. Modular design makes program writing and *debugging* (correcting problems in the program) easier, since each part of the program is small and simple. The grade-point-average program could be broken into modules, but it is simple enough that they really aren't necessary.

Building a Program

I'll use the grade-point-average program to demonstrate some of the commands in BASIC. (The complete grade-point-average program, which is explained step-by-step in text, is shown as a unit in listing 1.) The first BASIC statement used is REM, which stands for *remark.* It tells the computer that this is not something it has to operate on, so the computer ignores everything in the line after REM. This is one of the handiest BASIC statements because it lets you make comments throughout the program. Remarks explaining what each section of the program does make debugging easier. They also make it possible for you to return to a program long after it was written and quickly figure out how it works.

BASIC requires that lines of program code be numbered, so the first statement would be:

```
100 REM Program to Calculate
        Grade-Point Average
```

The 100 provides an opening line number. To allow for inserting extra lines later, leave ten numbers unused between the assigned line numbers. Additional remark statements could be inserted to specify the author of the program, the date it was written, and anything unusual about the program's operation. The next statement is also a remark.

```
110 REM Initialization
```

A program's effectiveness can be heavily influenced by the approach taken in the opening section. If you can be sure, for example, that the program will always be handling four courses of four credit hours each, you can limit the program to those conditions. But a program with that limitation would need rewriting if the conditions changed (if in a subsequent term the student took fewer courses, or if one of the courses taken had a different credit value). Always make your programs as general as possible, or programming will be a source of endless frustration. Trivial changes in circumstances should not require extensive changes in a program.

The first job in a program is to specify the *variables.* A variable is a symbol for something that will always be referred to in the same way but whose value may change. To assure that the variables start out at a known value, it is customary to initialize them, that is, assign them starting values at the beginning of the program. BASIC uses the equals sign (=) for assigning values. It

```
100 REM Program to Calculate Grade-Point Average
110 REM Initialization
120 LET A=0: C=0: H=0: P=0: R$=" ": G$= " ": N$=" ": X$=" "
130 REM A,avg;C,credits;H,total hrs;P,total pts
140 REM G$ is grade;N$,R$,X$ are responses
150 REM BODY—Request Data and Operate on it
160 PRINT "Do you have grades to report?(Yes/No)"
170 INPUT R$
180 IF LEFT$(R$,1)="N" THEN 400
190 PRINT "How many credits for the first course?"
200 INPUT C
210 LET H=H+C
220 PRINT "What was your grade? (A,B,C,D,F)"
230 INPUT G$
240 IF G$="A" THEN P=P+(C*4)
250 IF G$="B" THEN P=P+(C*3)
260 IF G$="C" THEN P=P+(C*2)
270 IF G$="D" THEN P=P+
280 PRINT "Another course?(Yes/No)"
290 INPUT N$
300 IF LEFT$(N$,1)="N" THEN 340
310 PRINT "How many credit hours for the next course?"
320 GOTO 200
330 REM Output Results
340 LET A=P/H
350 PRINT "Your grade point average is";A
360 IF A>3 THEN PRINT "That's pretty good."
370 PRINT "Another average to figure?(Yes/No)"
380 INPUT X$
390 IF LEFT$(X$,1)="Y" THEN 120
400 REM Conclusion
410 PRINT "OK. See you next term."
420 END
```

Listing 1: A BASIC program to calculate grade-point averages.

makes perfectly good sense in BASIC to say, for example, V=V+1, because you're not stating a fact of equality, but rather *assigning* the value shown on the right-hand side to the item shown on the left-hand side. BASIC also uses the LET statement for this purpose: for example, LET V=V+1. Including the LET can make the meaning clearer. (Some versions of BASIC require LET at the beginning of each assignment statement.) To initialize the main variables, then, we need a statement that assigns them their starting values:

```
120 LET A=0: C=0: H=0: P=0
```

To help remember which variable name is used for which item, it's useful to include another remark:

```
130 REM A,avg;C,credits;H,total hrs;
    P, total pts
```

You decide how data will be supplied during program planning. Two simple approaches are available in BASIC. The first is the DATA statement. If you have all the data required before the program is run, you can put it into one or more DATA statements at the end of the program and use a READ statement in the body of the program to access the data. This kind of program is shown in listing 2.

If, on the other hand, it is more convenient to provide the data while the program is running, an INPUT statement can be used. First the user is prompted with a question and an indication of the desired answer; then the INPUT statement tells the program to accept the reply entered on the keyboard. Since the computer needs a symbol for the input response, some additional variables are desirable. In this program we will use G$ for the grade received, and R$, N$, and X$ for other responses. The dollar sign ($) in these variable names indicates that instead of standing for numbers, they will stand for what are called *string variables*, that is, values that include letters of the alphabet. The user is also asked to input the number of credit hours (for which the variable C is used), but since that will be a number, the variable name doesn't need a $ after it. Let's add the extra variables to the initialization statement and a remark identifying them:

```
120 LET A=0: C=0: H=0: P=0:
    R$=" ": G$=" ": N$=" ":
    X$=" "
130 REM A,avg;C,credits;H,total
    hrs;P,total pts
140 REM G$ is grade;N$,R$,X$
    are responses
```

A string variable can't be initialized except as a value in quotation marks. To assign these string variables a neutral value, I have initialized them as spaces.

The body of the program comes next:

```
150 REM BODY—Request Data and
    Operate on it
```

First, the program sends the user a message with a PRINT statement. In BASIC, a PRINT statement causes the message in quotation marks that follows the command to be output. Since most modern personal computers use a video display, the PRINT command in their BASICs usually causes the indicated message to be displayed on the screen. To send the message to a printer, a slightly different form of the command, such as LPRINT, is required. For our purposes, a straight PRINT command is satisfactory:

```
160 PRINT "Do you have grades to
    report (Yes/No)"
```

This causes the message inside the quotation marks to appear on the screen, telling the user what is needed and indicating yes and no as correct responses. An INPUT statement then tells the computer to accept the user's response and provides a variable name by which to identify that response:

```
170 INPUT R$
```

To determine if the response given is a yes or a no, the computer compares the response with a known value. With string variables this can be done several ways. The simplest is to use a statement like this:

```
180 IF R$="NO" THEN 400
```

This requires an exact match between the user's response and the value shown in quotes (NO), which can have disadvantages. If the user makes a mistake in entering the reply, the computer can fail to recognize the answer. Mainly, however, it requires the user to enter the entire word, when a shorter response might be more convenient. In cases like this, the string operations available in some forms of BASIC can be used. For example, some BASICs have the LEFT$ command, which causes the computer to examine the first letters in a response. Line 180 can be changed to:

```
180 IF LEFT$(R$,1)="N" THEN 400
```

R$ and 1 in parentheses after LEFT$ specify which string variable is being examined (R$) and how many characters, beginning at the first one, to examine (1). The new version of line 180, then, asks for a comparison not with the entire response R$, but only with its first character. Using this form, the computer can recognize as a negative

```
100 REM Program to Multiply by Six and Give Result
110 LET A=0: B=0
120 REM A is the Multiplicand; B is the Product
130 READ A
140 B=A*6
150 PRINT A;"times 6 equals";B
160 GOTO 130
170 DATA 1,2,8,67,45,908,243,62,7,274
180 END
```

Listing 2: A multiplication program using DATA and READ statements. This program gets a different value for A from the DATA statement each time the READ statement is executed. It then sets B equal to the value of A times 6, prints the results, and attempts to repeat the process. When it runs out of data in the DATA statement, it will halt, indicating that it has stopped after exhausting the available data.

response any reply beginning with the letter N, thus making "N", "Nope", and "Not at all" all acceptable responses. Many newer versions of personal-computer BASICs have string functions of this sort, so I will use this form in the rest of the program. If yours doesn't offer this feature, use the original form of line 180 or request numeric responses and do numeric comparisons to achieve the same result.

When the nature of the response is known, a decision must be made: should the program continue its operation or terminate? A negative answer would call for termination, so that's what we check for, using an IF statement.

```
180 IF LEFT$(R$,1)="N" THEN 400
```

IF statements call for a comparison. They state a relation of some sort, which the computer is to examine. Here, we're asking it to find out if the first character of the reply is N. If it is, the answer given is no, in which case it can go to the termination phase of the program. If the comparison is false, that is, if the answer is yes, it moves on to the next statements, which are the first statements of the actual program operation:

```
190 PRINT "How many credits for the
        first course?"
200 INPUT C
```

The user has said he has grades to report, so line 190 asks for the credit hours earned for the first course. Line 200 accepts the user's reply, which will be a number. (It is worth noting that INPUT statements can be used to accept more than one item of data at a time. For example, "INPUT X,Y" would call for the user to enter two values—one for X and one for Y—separated by a comma. For ease in explaining this program, I have only used INPUT statements that request a single value.)

When the user enters a value for C, the running total of credit hours to which we assigned the variable H must be updated. H was initialized at 0 in line 120, but now the number of credit hours for the first course can be added to it:

```
210 LET H=H+C
```

H will now have the value of the number of credit hours the user has so far reported. The program must then determine what grade was earned for that course:

```
220 PRINT "What was your grade?
        (A,B,C,D,F)"
230 INPUT G$
```

Again the user is prompted to give the necessary information and told the form in which to reply. G$ is the string variable used for the grade that is entered.

Now the program must do some of the calculations. BASIC has the usual mathematical operators. Plus (+) is used for addition (3+1=4); minus (−) for subtraction (7−2=5); asterisk (*) for multiplication (4*2=8); and slash (/)

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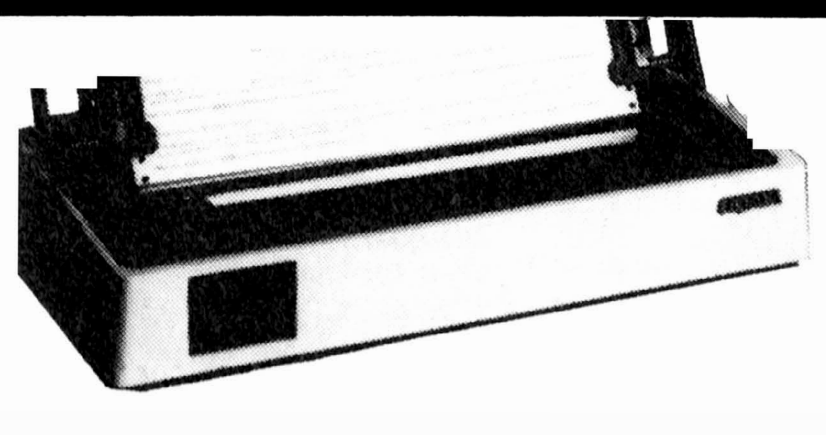

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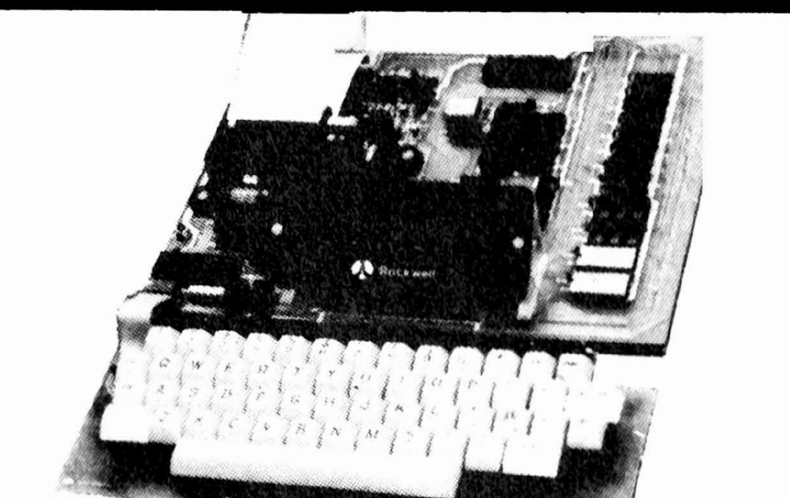

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for division (6/3=2). Most BASICs also have ways of representing exponents and other mathematical necessities, but the four common operators are adequate for our purposes.

The program must use the input letter grade to determine the point value needed in the calculations. There are several ways this can be done, but one of the simplest is to do another comparison, this time on the letter grade entered by the user:

```
240  IF G$="A" THEN P=P+(C*4)
```

If a grade of A is worth four points, the point total (P) must be increased by the product of C times 4. This IF statement begins by finding out if the grade reported was an A. If it was, the value of P is updated using the number of credit hours reported as C. If the grade reported wasn't an A, control falls through to the next statements:

```
250  IF G$="B" THEN P=P+(C*3)
260  IF G$="C" THEN P=P+(C*2)
270  IF G$="D" THEN P=P+C
```

This series of conditions tests in sequence to determine the grade reported. When the correct grade is identified, P is updated to show the correct point total. It would be possible to extend these statements to let the program move on to the next section once the right grade is found, but for purposes of clarity I have chosen not to do so. Since only one of the four grade options will be correct, control will drop through the other decisions.

There is no separate condition statement for a grade of F because an F, as worth 0 points, would add 0 times the credit hours, which would always be 0. The value of P won't change if the grade is F, so there is no need to specifically provide for it.

The program now needs to determine if any other courses are to be included in the computed average. If not, it can proceed directly to the output section; otherwise, it needs to request the relevant information:

```
280  PRINT "Another course?
     (Yes/No)"
290  INPUT N$
300  IF LEFT$(N$,1)="N" THEN 340
310  PRINT "How many credit hours
     for the next course?"
320  GOTO 200
```

If the reply to "Another course?" is negative, control shifts to the output section. Otherwise, a prompt more in keeping with reporting an additional course is used (line 310), and the program transfers control to the line that accepts the credit hours input (line 200). The process of getting the information and updating the values of the variables is then repeated until the user indicates that there are no more courses by answering no to the prompt in line 280.

Never expect a program to work the first time. Even experts plan debugging time into the development of any program.

Since the lines above handle all the acquisition of data and all the calculations required to prepare for developing and outputting results, the output phase of the program can now be written:

```
330  REM Output Results
340  LET A=P/H
```

The remark in 330 indicates the beginning of a new section of the program, and line 340 calculates the grade-point average by dividing the point total that has been developed (P) by the total number of credit hours (H). Many BASICs allow the user to output the result of such calculations directly (for example, PRINT P/H), but doing the calculation separately can have advantages, especially if you later want to extend the program to compare, for instance, averages earned in different terms. Given the average, all that remains is to report it:

```
350  PRINT "Your grade point
     average is";A
```

This line takes advantage of one of the spacing commands for PRINT statements that most versions of BASIC have. The section in quotation marks will be printed exactly as it is, just as in the other PRINT statements. The semicolon tells the program that you want a small amount of space between the material in quotation marks and the next item. (How much space depends on the version of BASIC.) Then the value of A is printed, because it is a defined variable name and isn't in quotes.

You can also add some extra output:

```
360  IF A>3 THEN PRINT "That's
     pretty good."
```

This statement compares the grade-point average just calculated with 3, which, on this scale, is a B average, and displays a favorable comment if the student's average is higher. Remarks like this are unnecessary, of course, but can make the program seem friendlier.

Before concluding the progam, it's useful to ask if the user has any more averages to compute:

```
370  PRINT "Another average to
     figure?(Yes/No)"
380  INPUT X$
390  IF LEFT$(X$,1)="Y" THEN 120
```

If the answer to the question is yes (or any other word that begins with the letter Y), control is transferred to line 120, which reinitializes the variables and starts the process anew. Otherwise, it is time to end the program. Here also, a message from the computer can make it seem more friendly:

```
400  REM Conclusion
410  PRINT "OK. See you next term."
420  END
```

The END command indicates the end of the program's operation.

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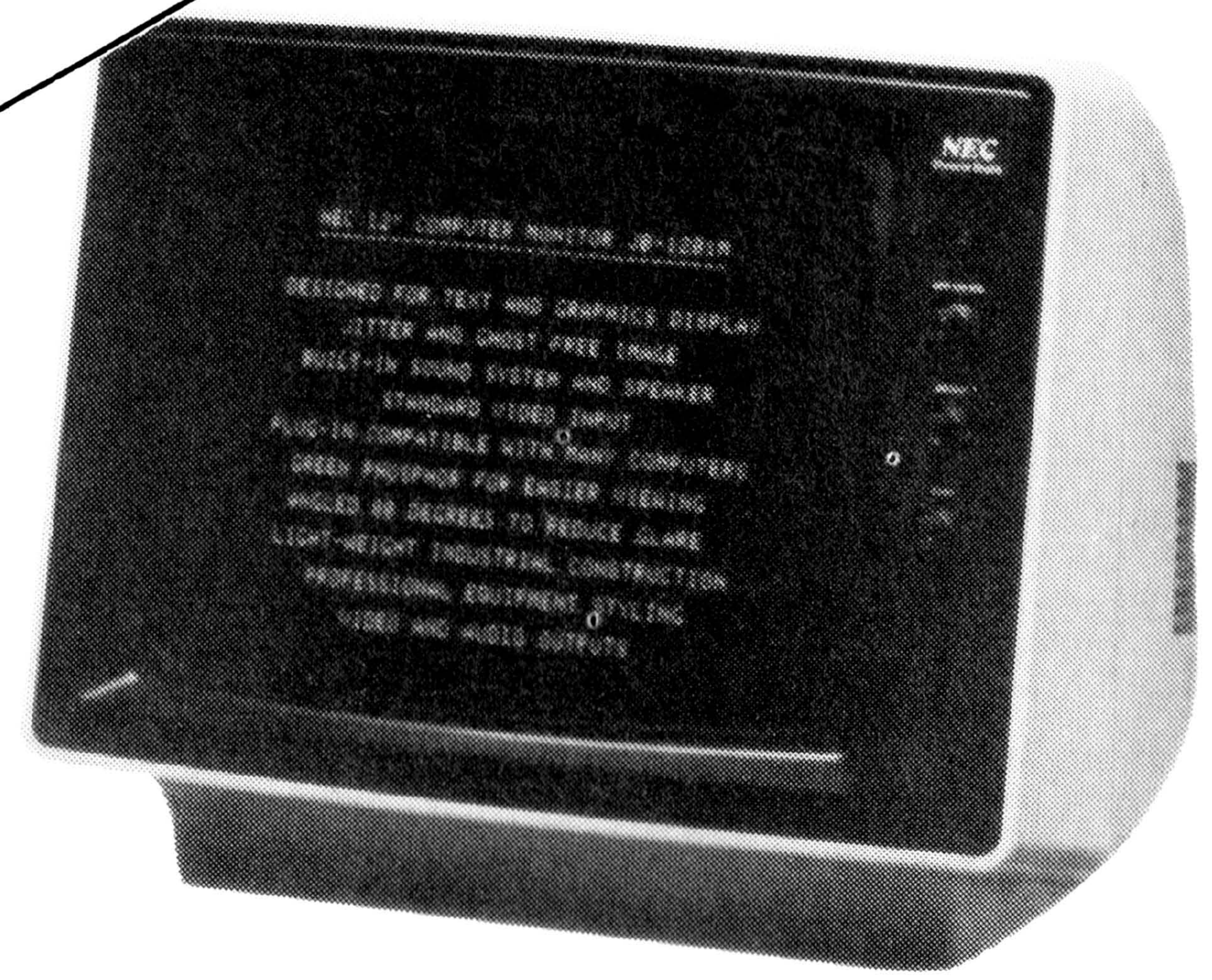

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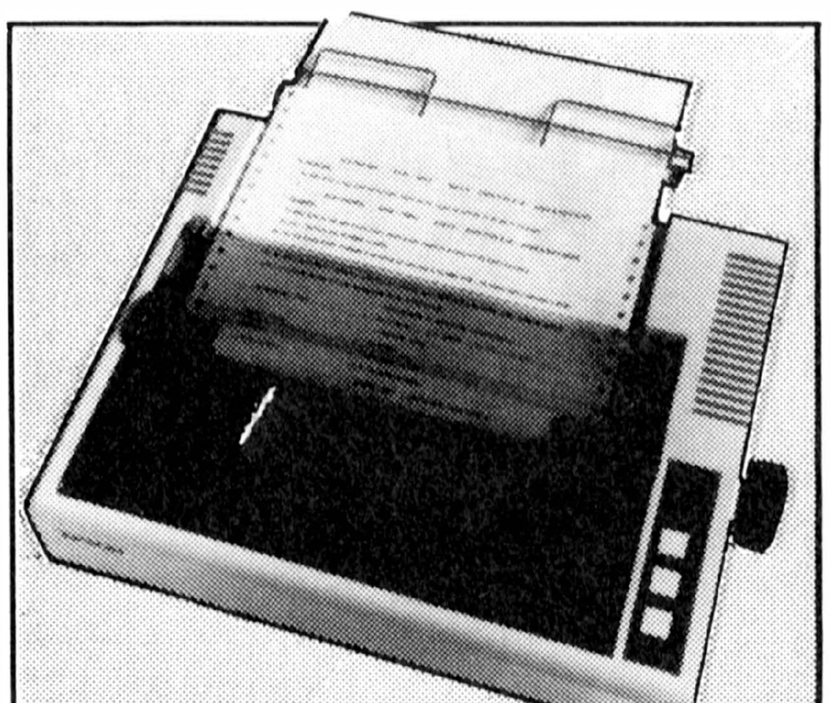

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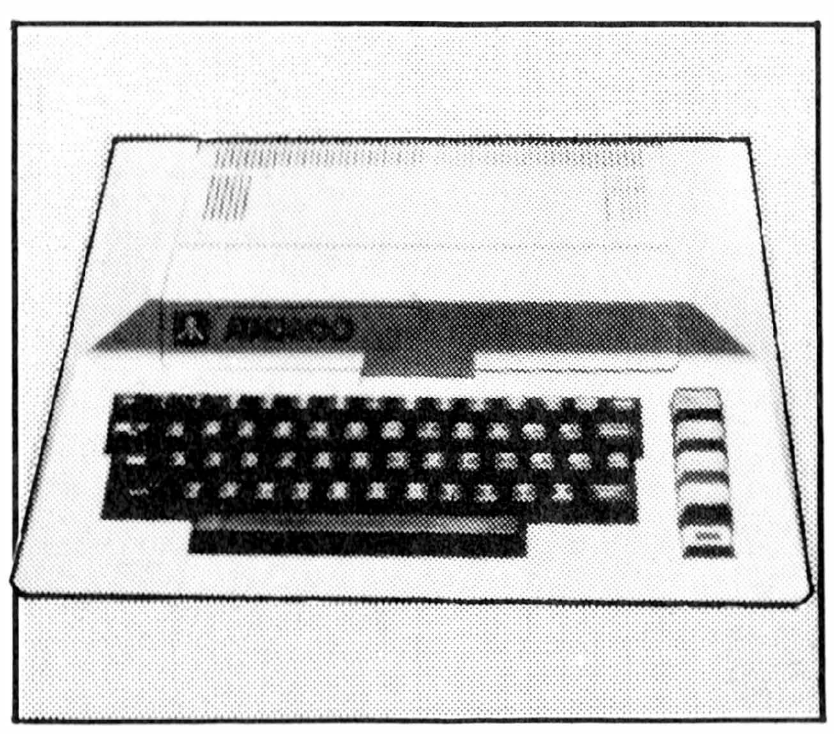

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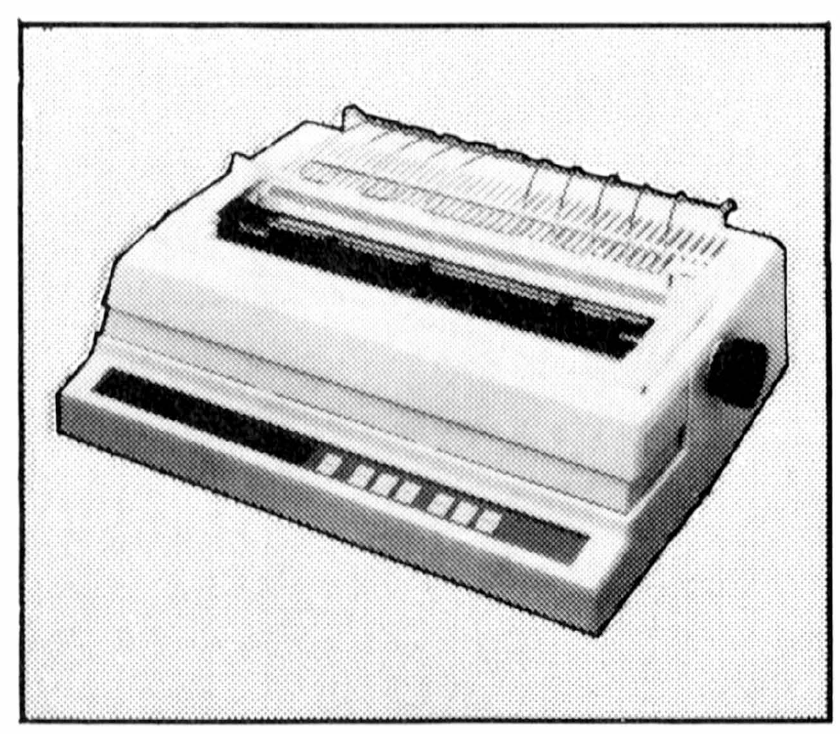

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Debugging

This sample program has been debugged, but never expect a program to work the first time. Even experts plan debugging time into the development of any program. The first object of debugging is to get the program to run. Debugging often involves correcting syntax errors or correcting other equally trivial problems. The next goal is to get the program to run right, because it does little good to have a running program if it gives the wrong results or is so clumsily written that it is slow or hard to use. This is the more difficult phase, since program failure of this sort usually reflects an insufficiently detailed understanding of the program's task.

Two tactics can simplify getting your program to run properly. *Documentation* of the program throughout its development, including the use of remarks in the code, copies of the listing for verifying correct entry of commands, and a copy of the plan of your program to assure that nothing has been omitted or garbled, can often speed identification and correction of errors. Keeping thorough documentation can also make it possible to return to the program and make updates long after it was written.

Traps let you monitor the program's operation at crucial points to verify that all is well. The simplest form of trap is to insert a PRINT statement in the code after each calculation to make certain that the results are correct. When an inaccurate result appears, the problem lies between the last correct result and the first faulty one. Some BASICs also have a CONTINUE statement. A STOP command after a PRINT (or other statement used this way) will halt the program while you check the results. When you're ready to go on, the CONTINUE command instructs the program to resume processing where it left off.

Commands in BASIC

The programs discussed here use a number of BASIC commands: REM for remarks; LET for assigning values; DATA, READ, and INPUT for providing data; the mathematical operators =, +, −, *, and /; the logical operators, >, <, and =; IF for decisions; GOTO for mobility within the program; PRINT or LPRINT for output; and STOP and END for terminating the program in different ways. Both numeric and string variables are used.

Once a program is entered, there are other useful commands. RUN tells the computer to execute the program, LIST lets you look at sections of the code to make changes or corrections, and SAVE causes the computer to store the program so you can LOAD it again later from tape or disk instead of having to enter it again by hand. The system manual will give the precise forms of these and other commands for use with your particular computer system.

These are the most essential elements in BASIC. Books and magazine articles can help to extend your knowledge of the language, but the best way to learn is to write programs. Only by using a programming language can you become comfortable with it. Begin by writing simple programs that only use the commands shown here. Then extend your vocabulary of commands by adding a few at a time. Sooner than you expect, you'll be writing complex programs that would have baffled you a short time before. □

Elizabeth Hughes is a freelance writer living in Doraville, Georgia.

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Auto Makers Take Electronics to the Streets.

"Ladies and gentlemen, speak to your engines!" With a simple voice command, the car of the future will be off and running, thanks primarily to microprocessors or "chips."

While electronic technology in automobiles should come as no surprise to any recent car buyer, the speed at which it's being incorporated is astounding. According to Ford Motor Company, the average 1970 luxury car included a mere 50 chips, and most of those were allotted to the radio. In contrast, the 1982 Mark VI boasts the miniaturized equivalent of 250,000 semiconductors. That's more startling when you realize that all this electronic muscle is devoted primarily to controlling gadgetry.

Someday soon, however, electronic technology will be in the driver's seat. Then your car will control such functions as ignition (based on its assessment of your alertness) and steering (to avoid collision or to follow a preprogrammed route).

Chips Take Off

Initial impetus for computerizing cars came from the federal government's restrictions on auto emissions. Chrysler got the wheels turning in 1974 with its Lean Burn System, an analog computer that analyzes air intake, emission levels, and engine temperature. Using this information, the system makes appropriate adjustments to maintain low emission levels yet burn fuel economically.

In 1979, General Motors and Ford incorporated the first digital computers into selected models. Although primarily emission-level controllers, the new computers included more diagnostic capabilities and greater engine control. Two years later, GM presented its most advanced system to date. The Computer Command Control, based on a Motorola 6800 microprocessor, still controls emission levels and fuel flow but also monitors 47 possible engine malfunctions. When a problem occurs, the computer alerts the driver with a blinking dashboard light. At the service station, a mechanic links the car's computer with the station's and reads the computer's diagnosis from a video display terminal (VDT). The same information can be obtained in numerical form from the auto's readout dashboard unit.

Ford, in hot pursuit, is offering a 16-bit microcomputer-controlled engine in many of its 1982 models. Honda Motor Company plans to take the same route soon. In fact, *Japan Economic Journal* predicts that before the close of 1982, half of the Japanese cars will feature electronic controls.

Roadblocks

Although today's cars rely on thousands of semiconductors, none takes full advantage of its computational potential. To put the built-in microprocessors to full use, two things must be added, and both are expensive:

•*Memory*. Going from process control to computation and interaction with the driver will require much more storage space. GM now puts its most advanced computer system in the Cadillac series; that system requires over 12,000 bytes of memory (enough to store a BASIC-language interpreter). Other less expensive cars have to get by with as few as 2000 bytes of memory.

•*Transducers* (devices that sense physical conditions and report them in electronic form). It takes a lot of these to keep the microprocessor informed of conditions inside the engine (manifold pressure, carburetor mixture, etc.) Adding transducers to detect other conditions (exterior temperature, rain, sudden change in velocity or direction, for example) is going to be expensive.

The bottom line seems to be that if you want a $1500 personal computer with your new car, you're going to have to pay that much extra for one. Until memories and transducers come down in price, the computerized car won't be a feasible market item.

Another roadblock to implementing electronic technology lies in driver-to-computer communications. Zenith is revving up its V-CRT, a vehicular cathode-ray tube capable of displaying graphic symbols, numbers, and letters. Zenith's Rudy Ziedler says the tube would fit behind the steering wheel and could be programmed through a cassette tape. Using a finger or a light pen on an infrared-sensitive screen, the driver could interact with the system. If, however, drivers were willing to communicate via a number code (but thereby have access to less information), industry experts believe the V-CRT could be scrapped in favor of less expensive dashboard displays.

Finally, new technology always arrives with new problems in tow. Auto mechanics accustomed to the old electro-mechanical systems will have to be retrained to properly service the microelectronic systems. This creates additional cost which, of course, must be subsidized by consumers.

Tail Pipe Dreams

"Good morning. It's February 14, 1992. Don't forget to pick up dry cleaning, 1 gallon of milk, and 1 box of chocolates on our return trip. Automatic pilot is now engaged. Enjoy your nap."

Fasten your seat belt because the car of the future is approaching at high speed. Most features now available remain in the realm of gadgetry: digital clocks, fuel monitors, and a speech synthesizer that, by means of the radio, reminds the driver to check oil, brakes, and fuel. Cars to come, however, will probably bear a strong resemblance to a jet cockpit, both in appearance and function (except, of course, with respect to the altitude-related equipment).

For those of you who enjoy taking trips but loathe planning them, your ultramobile will display videodisc lists of noteworthy sights, restaurants, and motels en route. Chip-to-shore communications will keep you in touch with a highway patrol computer for the latest road conditions; a navigational aid will pinpoint your location on a videodisc map, using local radio transmissions as references.

More importantly, your "carputer" will refuse ignition commands if sensors detect any unsteadiness on your part. Another life-preserving feature will gauge proximity of moving and stationary objects, and, if collision seems likely, will assume control of the vehicle. If you were to doze off, the ideal mobile would rouse you with a few deafening horn blasts. You'd then (perhaps somewhat sheepishly) engage automatic pilot control, a descendant of the system Honda is presently developing.

The four-wheeled computer will also take on all the functions performed by the personal computer, including telecommunications for stock market analyses, business forecasting, and budgetary calculations.

Although there'll be many detours on the road to tomorrow's auto, some icy morning your electronic chauffeur will have already warmed up the car, defrosted the windows, and decided on the best route to take, considering current traffic and weather conditions.

You'll still get to shovel the driveway, though. □

Marc Stern is a freelance writer who lives in Framingham, Massachusetts.

Photo courtesy of Chrysler Corporation.

The NEC PC-8000

The quality-conscious Japanese have sent us their finest computer with sparkling graphics and an emphasis on software.

by Joe Langdon

Despite recent talk about the "Japanese Invasion" of the American personal computer market, few Japanese products have as yet appeared on American computer store shelves. One computer that *has* made an impressive showing is the NEC PC-8000 from NEC Home Electronics, U.S.A. The main component in the system is the keyboard, dubbed PC-8001A ("A" for American version). This beautifully designed computer is a veritable cherry blossom from the Far East.

In Japan, where the competition is fierce, the PC-8000 system (first available in 1979) is the hands-down winner with over 50,000 units sold and almost 5000 units selling each month. The decision to market it in the U.S. was made in early 1981. Since then, NEC Home Electronics has moved fast to set up its own distribution network and capture a well-deserved share of the microcomputer market.

As a fully satisfied owner of the Japanese version, I take word processor in hand to give you this user's report.

Keyboard

The basic computer is contained in a versatile, compact 82-key keyboard unit (PC-8001A). The standard English characters, graphics symbols, and the Greek alphabet are included (the Greek replaces the Japanese katakana on the domestic version). By hitting a button, you can switch the keyboard layout from the traditional "QWERTY" format to an alphabetical arrangement. Although this latter setup is excruciatingly strange to touch-typists, it's a user-friendly method for children and adults with little typing expertise.

The NEC PC-8000 system, with keyboard, I/O unit, dual mini-disk drive, printer, and color monitor. Each part of the system has its own model number; for example, the keyboard is the PC-8001A.

One of the handiest features on the keyboard (one that more and more American companies are including) is the addition of special function keys. With these five keys, a single keystroke can be defined to represent a sequence of up to 16 characters, a boon to anyone doing programming. Instead of typing out BASIC commands like PRINT and INPUT, you can store them and use the function keys for recall. The function keys are also useful for other graphics and software commands, and their contents can be displayed on the bottom line of your video terminal if you forget what you've programmed them for.

The system's excellent human engineering shows up the more you use the PC-8001A. The keys make a slight noise that's helpful feedback for touch-typists and any key will repeat when pressed for more than one second. For business applications requiring vast entries of numbers, there's a 10-key numeric keypad on the right.

One of the most user-friendly features is the computer's extensive editing capability (with no need for special software). You can move the cursor to *any* part of the screen and insert or delete characters there (other systems restrict you to one line).

Display

The PC-8000 system can display either 40 or 80 characters per line. The

larger letters are easier to read and are perfect for displaying program listings, but the 80-character line is a virtual necessity for word processing as a document will appear in a form similar to what it will look like when typed out. You can display either 20 or 25 lines, with the 20-line display making text easy to read and the 25-line option for crisp graphics. Another handy feature is the "split-screen" option for "freezing" information on one part of the screen and changing other parts.

Graphics is where the PC-8000 really shines. If you use a high-quality color graphics monitor (like the one that NEC sells), you can produce some of the most eye-grabbing graphics available on a small computer. A variety of different dot-densities is available, the most useful being 160 by 100 because you can display all eight available colors and also mix text on the screen. A large assortment of characters is available for graphics, including lines, shapes, card suits, and others. (Some of the most popular programs available in Japan are games that make full use of color graphics and animation.)

What's Inside?

The PC-8000 uses a special NEC microprocessor that's essentially identical to the Z80 used in many American small computers. It zips along at 4 million cycles per second—that means programs run fast. The keyboard unit comes with 32 K bytes of RAM (random-access memory) built in and is expandable. The powerful N-BASIC language is contained in ROM (read-only memory) and is automatically started when the computer is turned on. N-BASIC was designed by Microsoft, the American company whose version of BASIC has become the de facto standard. It has a number of advanced features that make it useful for programmers, including color commands and a clock/calendar for business applications and real-time games.

Software is also built in to turn the system into a terminal. This *communication software* allows you to hook up your computer to a telephone line and access online utilities like The Source and CompuServe. (You need a "modem" telephone adapter to do this.) With most American computers, you must buy the "terminal" software to hook up.

Also in the ROM is a *machine-language monitor* that enables advanced programmers to communicate with the computer in the binary form it understands at its most basic level.

The PC-8001A computer/keyboard has been beefed up with special shielding to meet the FCC's stringent radio/frequency interference regulations in the U.S.

Accessories

Using an optional TV adapter, you can hook the keyboard to your own black-and-white or color TV, but you can only display a 40-character line. If you want to display the 80-character line for word processing or other related uses, you need a video monitor. NEC sells both a black-and-white monitor ($285) and a high-resolution color video monitor ($1095). The color display is so striking that it's already become the standard for excellence in the industry. You can hook any cassette recorder/player directly to the keyboard for loading programs to or from cassette tape.

One major difference between the Japanese and American small computer markets is that in Japan few owners can afford disk drives (about 5 percent compared to about 80 percent in the U.S.). Consequently, the NEC PC-8031 dual disk drive ($1295) is considerably less expensive in the U.S. The drive unit contains two 5¼-inch drives that store data in a double-density format (twice as much information as standard single-density). Each disk holds 143 K (146,432) bytes of data. To connect the drives, you need an optional expansion unit ($795). The expansion unit also provides several interfaces for connecting other accessories made by independent manufacturers.

Although almost any printer will hook up to the PC-8000 through the use of the optional expansion unit, NEC currently sells a dot-matrix printer that prints both text and graphics at 100 cps (characters per second). The printer retails for $795 and uses both regular and pin-feed paper.

A wide range of software is available for the PC-8000 in Japan. Most popular are the games that take advantage of the machine's superb color graphics. There is also a large assortment of business software. Recently, a Japanese company made the popular CP/M disk operating system available for the PC-8000, the *first* time CP/M has been available for a color computer. This market entry opens up the machine for

At a Glance

Name: NEC PC-8000 system (U.S. model)

Uses
Personal computing, small businesses, professional firms, schools and universities, scientific institutions, homes

Standard Features
Z80-compatible microprocessor; keyboard: 82-key, typewriter-style; display: 80 characters by 25 lines of text, 160 by 100 graphics resolution, 248 displayable characters and graphics symbols, eight colors; memory: 32 K bytes of RAM (expandable to 160 K), 24 K bytes of ROM (expandable to 32 K) with BASIC, data-terminal and monitor software included; interfaces for: color or monochrome monitor, audiocassette, RS-232C devices, parallel printer; power supply and AC line cord

Manufacturer
Nippon Electric Company (Japan)
U.S. sales office:
NEC Home Electronics, U.S.A.
1401 Estes Ave.
Elk Grove Village, IL 60007
(312) 640-3750

Base List Price
$1295 for keyboard unit (PC-8001A) only; monitor, disk, input/output unit, and other optional devices extra

Typical System Price
$2200 for keyboard with monochrome display

Other Software Available
CP/M operating system

Popular Accessories
Input/ouput unit, disk drives, cassette recorder, modem

use with the thousands of CP/M programs available.

NEC seems to have realized early on that the only way to succeed in the U.S. small-computer market is to have plenty of software available. A variety is already available, including small-business packages, advanced programming languages (such as FORTRAN), and several operating systems, including CP/M. The company will also release one of the first *color* word-processing packages, including a 12,000-word dictionary and a "teaching" mode.

This beautifully designed computer is a veritable cherry blossom from the Far East.

For the user interested in learning how to program, the NEC people have released a six-part "Creative Programming Series" developed at Eastern Illinois University. This is one of the most comprehensive, easy-to-use tools ever for learning BASIC; the six-volume course takes you from the simplest concepts to advanced techniques.

On top of the "in-house" software on the market, NEC is also cooperating with major American software houses and the PC-8000 library will expand even more in the near future.

Choosing a personal computer is a confusing task these days, especially with new models regularly appearing on the market and each advertised as the best and the brightest. But if you take a cue from the quality-conscious Japanese, you'll consider (as I did) the PC-8000 system. Japan has sent us its finest. □

Joe Langdon is a freelance writer working in Tokyo.

Twinkling Stars, a Birthday Message and a Mad Artist

by George Firedrake and Ramon Zamora

"My Computer Likes Me" is for people who want to help kids learn to use, program, and enjoy the TRS-80 Color Computer. These ideas are best used when a kid asks, "How does the computer do that?" or "How can I make the computer do what I want it to do?" or "Can the computer tell me . . . ?"

If you have a TRS-80 Color Computer, gather some kids around it and help them enjoy—and learn to understand—simple programs in Color BASIC. Here are ideas on how to go about it, including short programs that many kids have enjoyed.

We suggest things to do. *You* explain what is happening, answer questions, modify our ideas, and enrich the adventure with your own ideas. But don't do the typing. Let the kids do the hands-on stuff. Be patient—let them make mistakes, correct their own mistakes, and, especially, encourage them to EXPERIMENT!

Some of the programs are *supposed* to end with an error message like FC ERROR. When this happens, try to figure out what caused the error. Then read on. . . we'll probably deal with it in a later paragraph.

If you are a beginner, we unabashedly suggest you teach yourself Color BASIC by working your way through *TRS-80 Color BASIC* by Bob Albrecht (sometimes known as George Firedrake), published by John Wiley & Sons.

One Star Twinkling

Imagine that the screen is the night sky and the first star has just come out. It should twinkle, of course. Make it happen by using this program.

```
100 REM ** ONE STAR TWINKLING
110 CLS 0

200 REM ** RANDOM SKY POSITION &
       COLOR
210 OVER = RND(64) - 1
220 DOWN = RND(32) - 1
230 KOLOR = RND(8)

300 REM ** TWINKLE ON
310 SET(OVER, DOWN, KOLOR)
320 TT = 100: GOSUB 810

400 REM ** TWINKLE OFF
410 RESET(OVER, DOWN)
420 TT = 100: GOSUB 810

500 REM ** GO TWINKLE IT AGAIN
510 GOTO 310

800 REM ** TIME DELAY SUBROUTINE
810 FOR KK = 1 TO TT: NEXT KK
820 RETURN
```

When you run this program, the "sky" is black (line 110); one "star" appears somewhere on the screen and twinkles on and off until you press **BREAK**.

Where might the lonely star appear? Look at lines 210 and 220. The value of **OVER** can be any number from 0 to 63; the value of **DOWN** can be any number from 0 to 31.

What color is the star? Look at line 230. The value of **KOLOR** can be any number from 1 to 8. So the star might be green, or yellow, or blue—any one of the eight colors the computer can show on the screen.

Block 300 (lines 300-320) turns on the star. If you want it to stay on a little longer, change the value of TT in line 320. Make it bigger. Oh, you want the star to stay on for a shorter time? Make TT smaller.

Block 400 (lines 400-420) turns off the star. Together, blocks 300 and 400 cause the star to twinkle. Line 500 causes this to happen again and again and again until someone presses the **BREAK** key.

Block 800 is the time-delay subroutine. It is *called*, or used, by block 300 (line 320) and block 400 (line 420).

Run One Star Twinkling a few times. Carefully explain how and why it works, then read on.

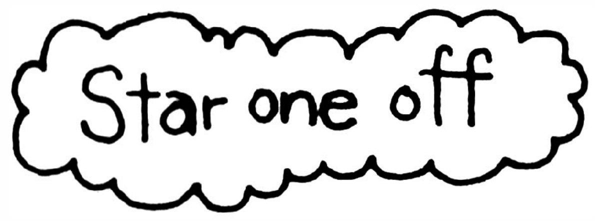
Two Stars Twinkling

Another star comes out. Lonely twinkling star is no longer lonely.

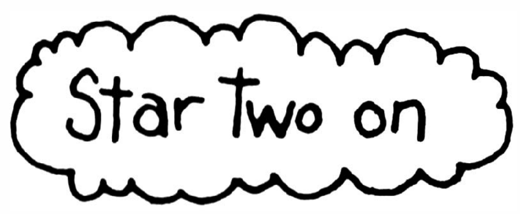
```
100 REM ** TWO STARS TWINKLING
110 CLS 0

200 REM ** STAR 1 POSITION & COLOR
210 R1 = RND(64) - 1
220 D1 = RND(32) - 1
230 C1 = RND(8)
```

```
300 REM ** STAR 2 POSITION & COLOR
310 R2 = RND(64) - 1
320 D2 = RND(32) - 1
330 C2 = RND(8)

400 REM ** TWINKLE STAR 1
410 SET(R1, D1, C1)
420 TT = 100: GOSUB 810
```

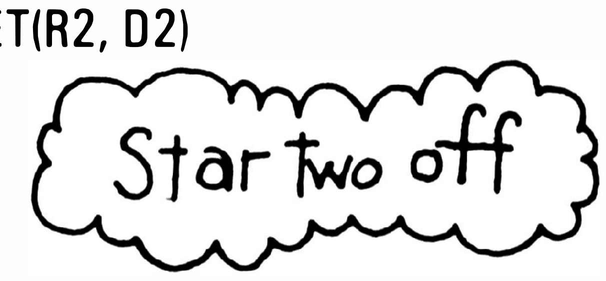

```
430 RESET(R1, D1)
440 TT = 100: GOSUB 810
```




```
500 REM ** TWINKLE STAR 2
510 SET(R2, D2, C2)
```




```
520 TT = 100: GOSUB 810
530 RESET(R2, D2)
```

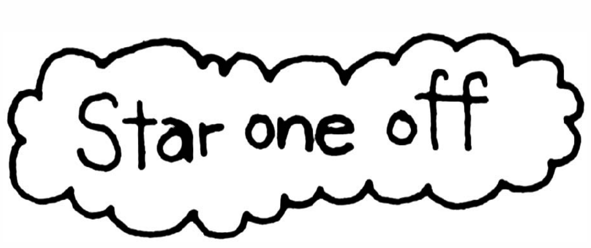



```
540 TT = 100: GOSUB 810

600 REM ** GO TWINKLE THEM AGAIN
610 GOTO 410

800 REM ** TIME DELAY SUBROUTINE
810 For KK = 1 to TT: NEXT KK
820 RETURN
```

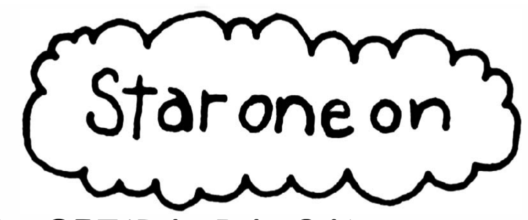
Before you read on, **RUN** this program several times. Do the two stars behave in a somewhat unstarlike fashion? Oops! The stars seem to take turns being on the screen. Only one star is on at a time—that's not quite what we wanted.

What's the problem? Look at blocks 400 and 500. When we twinkle a star, we first turn it on, then off. So it is off while the other star is being twinkled. Fix it like this:

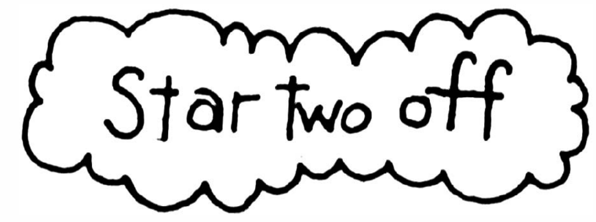
```
400 REM ** TWINKLE STAR 1
410 RESET(R1, D1)
```



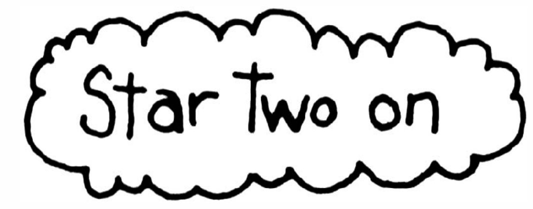

```
420 TT = 100: GOSUB 810
```




```
430 SET(R1, D1, C1)
440 TT = 100: GOSUB 810

500 REM ** TWINKLE STAR 2
510 RESET(R2, D2)
```




```
520 TT = 100: GOSUB 810
530 SET(R2, D2, C2)
```




```
540 TT = 100: GOSUB 810
```

If you object to turning a star **OFF** before it has ever been turned on, add these lines to the program.

```
240 SET(R1, D1, C1)
340 SET(R2, D2, C2)
```

If you are teaching kids how to program, explain why we used:

► **R1, D1, C1 instead of OVER1, DOWN1, KOLOR1**

► **R2, D2, C2 instead of OVER2, DOWN2, KOLOR2**

Variation: Make the blinking time random. For example:

```
420 TT = RND(200): GOSUB 810
```

More Stars Twinkling?

How would you write a program to make three stars twinkle? Four stars? More stars? Before you do, try this variation of Two Stars Twinkling.

```
100 REM ** TWO STARS TWINKLING
110 CLS 0

200 REM ** STAR 1 POSITION & COLOR
210 R1 = RND(64) - 1
220 D1 = RND(32) - 1
230 C1 = RND(8)

300 REM ** STAR 2 POSITION & COLOR
310 R2 = RND(64) - 1
320 D2 = RND(32) - 1
330 C1 = RND(8)

400 REM ** TWINKLE THE STARS
410 OVER = R1: DOWN = D1: KOLOR = C2
420 GOSUB 910
430 OVER = R2: DOWN = D2: KOLOR = C2
440 GOSUB 910

600 REM ** GO TWINKLE THEM AGAIN
610 GOTO 410

800 REM ** TIME DELAY SUBROUTINE
810 FOR KK = 1 TO TT: NEXT KK
820 RETURN

900 REM ** TWINKLE STAR SUBROUTINE
910 RESET(OVER, DOWN)
920 TT = 100: GOSUB 810
930 SET(OVER, DOWN, KOLOR)
940 TT = 100: GOSUB 810
950 RETURN
```

OK, everybody. Write a program to twinkle three stars. Next time we will build a program to twinkle more stars, the *easy way*.

Oh yes—when you **RUN** the program called Two Stars Twinkling, why is it possible (but very unlikely) to have only *one* star twinkling? Of course, you might not see this because the odds against it happening are 2048 to 1!

Instead of stars in random positions on the screen, put a constellation on the screen. The Big Dipper? Orion? Draco?

Happy Birthday

Here is a little program that will give you some practice in using **PRINT@** and **SET** together. We call it A Happy Birthday Card for Mother. We begin by sketching the desired birthday card on a screen map: see the opposite page.

We think Mother will like your computer when you **RUN** the following program.

```
100 REM ** A BIRTHDAY CARD FOR
      MOTHER
110 CLS

200 REM ** DRAW TOP & BOTTOM
      BORDER
210 FOR OVER = 0 to 63
220   SET(OVER, 0, 4)   }
230   SET(OVER, 1, 4)   } Top
240   SET(OVER, 30, 4)  }
250   SET(OVER, 31, 4)  } Bottom
260 NEXT OVER

300 REM ** DRAW LEFT & RIGHT BORDER
310 FOR DOWN = 0 to 31
320   SET( 0, DOWN, 4)  }
330   SET( 1, DOWN, 4)  } Left
```

```
340  SET(62, DOWN, 4) } Right
350  SET(63, DOWN, 4) }
360  NEXT DOWN

400  REM  **  THE  HAPPY  BIRTHDAY
     MESSAGE
410  PRINT @ 171, "H A P P Y";
420  PRINT @ 232, "B I R T H D A Y";
430  PRINT @ 298, "M O T H E R";

500  REM * * WAIT A BIT, THEN REPEAT
510  ZZ = 2300
520  FOR KK = 1 TO ZZ: NEXT KK
530  GOTO 110
```

When you **RUN** the program, you see Happy Birthday Mother in black letters on a green background with a red border around the edge of the screen. *You* can modify the program in many ways such as the following.

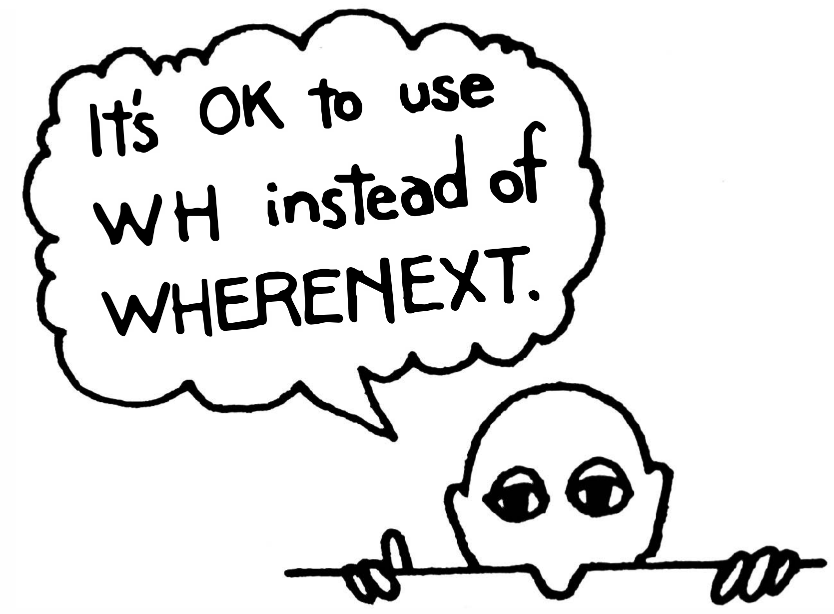
- Have the computer play the happy birthday song.
- Use different colors for the background and border.
- Put some "twinkling stars" on the screen while the happy birthday message is displayed.
- Blink the birthday message seven times.

Oh, it's not your mother's birthday? Change the message to Merry Christmas Santa or Happy Easter Bugs or The Force Is With You or Take a Dragon to Lunch or whatever message *you* want. Use the screen map on page 98 to sketch your design. (It's OK to make copies of this screen map for your own use.)

Mad Artist Meanders

Mad Artist Meanders right, left, up, or down.

```
100  REM ** MAD ARTIST MEANDERS
110  CLS 0

200  REM ** MAD ARTIST APPEARS
210  OVER = 31
220  DOWN = 15
230  KOLOR = RND(8)
240  SET(OVER, DOWN, KOLOR)

300  REM  **  WHITHER  SHALL  SHE/HE
     MEANDER?
310  WHERENEXT = RND(4)

400  REM ** MAD ARTIST MEANDERS
410  IF WHERENEXT = 1 THEN
     OVER = OVER + 1
420  IF WHERENEXT = 2 THEN
     OVER = OVER - 1
430  IF WHERENEXT = 3 THEN
```




```
     DOWN = DOWN + 1
440  IF WHERENEXT = 4 THEN
     DOWN = DOWN - 1

500  REM ** MAD ARTIST PAINTS
510  KOLOR = RND(8)
520  SET(OVER, DOWN, KOLOR)

600  REM ** KEEP MEANDERING
610  GOTO 310
```

Mad Artist first appears near the center of a black screen, then meanders up, down, left, or right—painting as he goes. In line 310, **WHERENEXT** will be 1, 2, 3, or 4.

If **WHERENEXT** is 1, Mad Artist goes right (line 410).

If **WHERENEXT** is 2, Mad Artist goes left (line 420).

If **WHERENEXT** is 3, Mad Artist goes down (line 430).

If **WHERENEXT** is 4, Mad Artist goes up (line 440).

Eventually, Mad Artist will wander off the screen and you will see this:

?FC ERROR IN 520

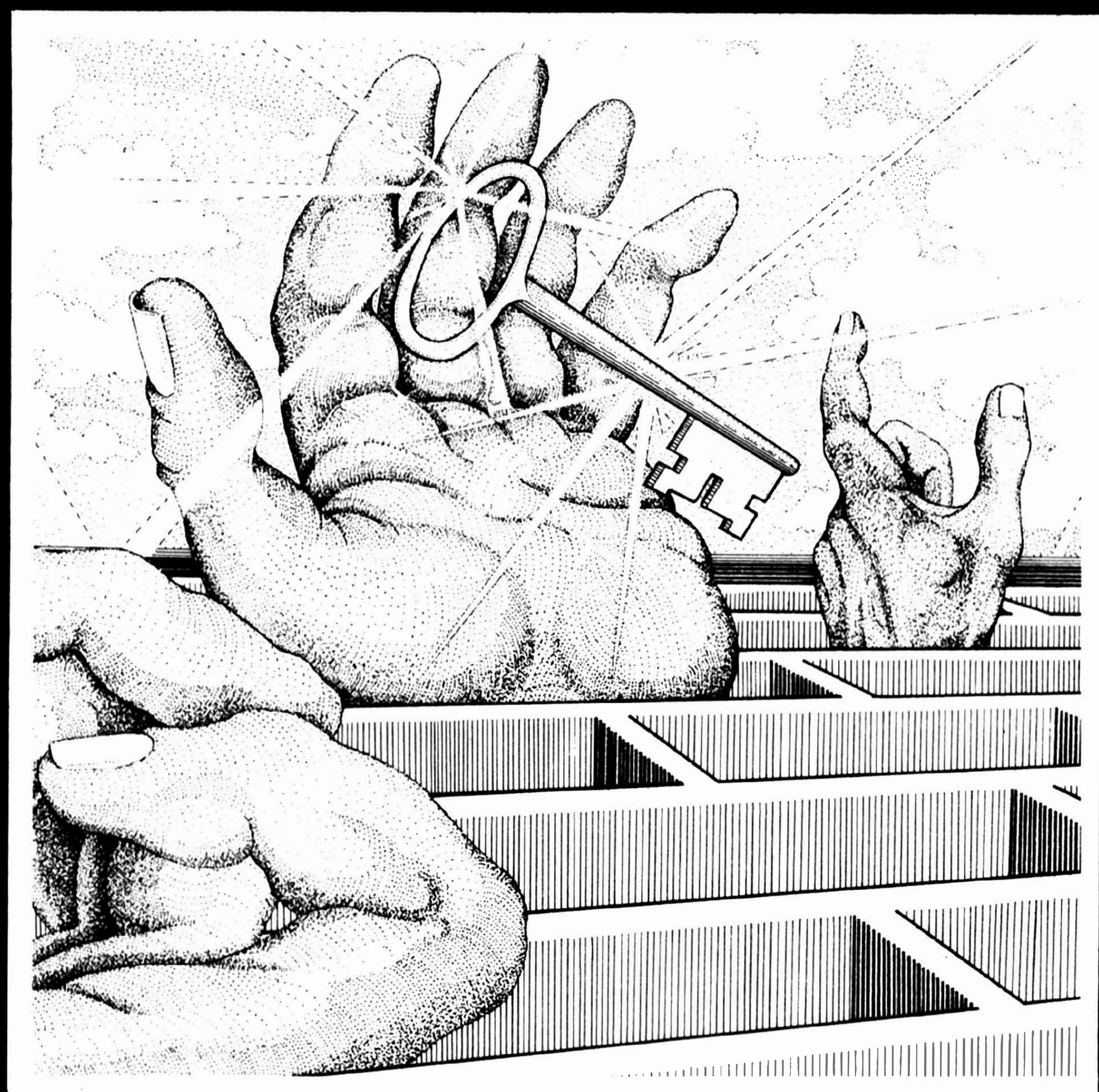
This happens if the value of **OVER** becomes more than 63 in line 410 or less than 0 in line 420. It also happens if **DOWN** becomes more than 31 in line 430 or less than 0 in line 440.

Can you fix the program so that Mad Artist doesn't wander off the screen? Perhaps Mad Artist senses the edge of the screen and dares not venture farther.

Or perhaps Mad Artist explores beyond the edge of the screen (*without* an **ERROR** message), then reappears somewhere along the edge of the screen.

Could it be that Mad Artist disappears from the screen, then sends messages back from the world beyond the screen?

If you want more Adventures of Mad Artist, be sure to let us know.



Reader Service

*Corresponding directly with company

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Again, Racing Colors

Ha! We bet you thought that we wouldn't get back to Racing Colors. Last month, if you recall, those flashy colors, green and red, were racing across the screen.

As you know, our program was unfair. It favored green to win. So try this program, which favors neither color.

```
100 REM ** RACING COLORS #2
110 CLS 0

200 REM ** START RACE AT LEFT OF
        SCREEN
210 GX = 0: SET(GX, 16, 1)
220 RX = 0: SET(RX, 24, 4)

300 REM ** ROLL DICE, GREEN & RED
310 GD = RND(6)
320 RD = RND(6)

400 REM ** WHICH IS AHEAD NEXT?
410 GN = GX + GD
420 RN = RX + RD
430 IF GN < RN THEN 510
440 IF GN = RN THEN 610
450 IF GN > RN THEN 710

500 REM ** ADVANCE RED, THEN GREEN
510 GOSUB 910: GOSUB 810
520 GOTO 310

600 REM ** TIE—FLIP A COIN
610 COIN = RND(2)
620 IF COIN = 1 THEN 510 ELSE 610

700 REM ** ADVANCE GREEN, THEN RED
710 GOSUB 810: GOSUB 910
720 GOTO 310

800 REM ** ADVANCE GREEN
810 FOR K = 1 TO GD
820   GX = GX + 1
830   SET(GX, 16, 1)
840   SOUND 89, 1
850 NEXT K
860 RETURN

900 REM ** ADVANCE RED
910 FOR K = 1 TO RD
920   RX = RX + 1
930   SET(RX, 24, 4)
940   SOUND 108, 1
950 NEXT K
960 RETURN
```

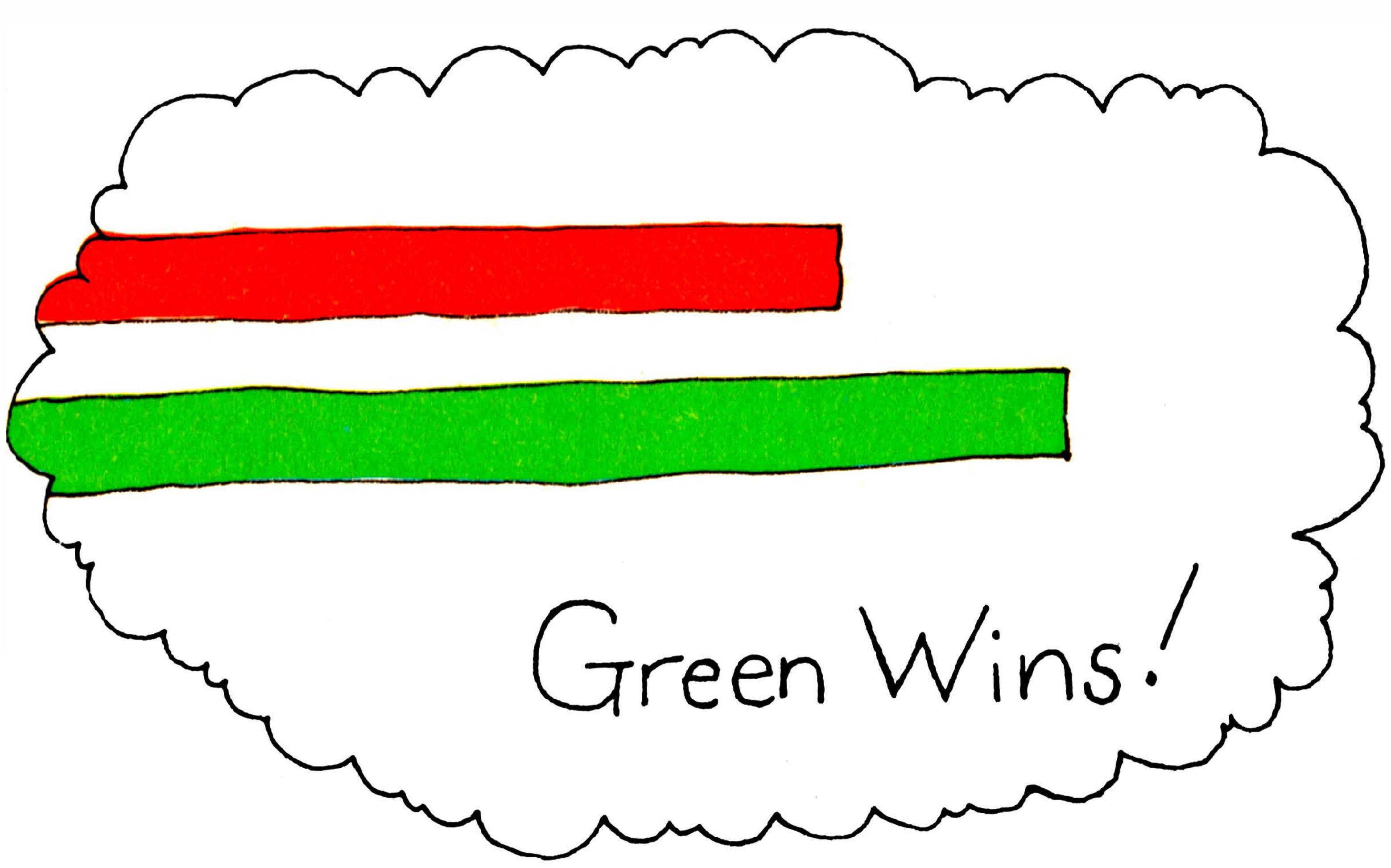
In this program, block 400 computes which color will be in the lead. The color holding the lead is then advanced first. That seems fair, doesn't it? In case of a tie, the computer "flips a coin" in block 600 to decide which color is advanced first.

As before, the race ends with an **FC ERROR** when the winning color goes off the right edge of the screen. This occurs at line 830 (green is the winner) or line 930 (red is the winner).

Your turn. Fix the program so that the race stops when the winning color reaches the right edge of the screen. Put an appropriate message on the screen (**THE WINNER IS . . .**) and make it easy for someone to restart the race. If you know how to use **INKEY$**, use it!

Variation. In block 400, instead of three **IF** statements, you can use one **ON . . . GOTO . . .**

```
400 REM ** WHICH IS AHEAD NEXT?
410 GN = GX + GD
420 RN = RX + RD
430 ON SGN(GN - RN) + 2 GOTO 510,
        610, 710
```



Remember, we assume that *you* know about BASIC words such as **ON** and **SGN**. If not, let us know and we'll include a short tutorial in a future issue of *Popular Computing*.

Reaction Time Theater

After all that heavy thinking, perhaps you would like to do something physical. Warm up your reflexes by trying our Reaction Time Program.

```
100 REM ** REACTION TIME PROGRAM

200 REM ** TELL HOW TO PLAY
210 CLS
220 PRINT "HOW FAST ARE YOU? WHEN I
        START"
230 PRINT "COUNTING, PRESS THE SPACE
        BAR"
240 PRINT "AS FAST AS YOU CAN TO
        STOP ME."
250 PRINT
260 PRINT "PRESS ANY KEY AND I'LL
        BEGIN."
270 IF INKEY$ = "" THEN 270

300 REM ** CLEAR SCREEN, RANDOM
        DELAY
310 CLS
320 Z = RND(2000)
330 FOR K = 1 TO Z: NEXT K

400 REM ** START COUNTING. SPACE
        STOPS IT.
410 X = 1
420 PRINT @240, X
430 IF INKEY$ <> " " THEN X = X + 1:
        GOTO 420

500 REM ** TELL HOW TO PLAY AGAIN
510 PRINT @0, "TO PLAY AGAIN, PRESS
        ANY KEY."
520 IF INKEY$ = "" THEN 520 ELSE 210
```

You might want to change this to 310.

Enter this program carefully. In lines 270 and 520, there is *no* space between quotation marks. In line 430 there is *one* space between quotation marks.

```
270 IF INKEY$ = "" THEN 270
```

no space

```
430 IF INKEY$ <> " " THEN X = X + 1:
    GOTO 420
```

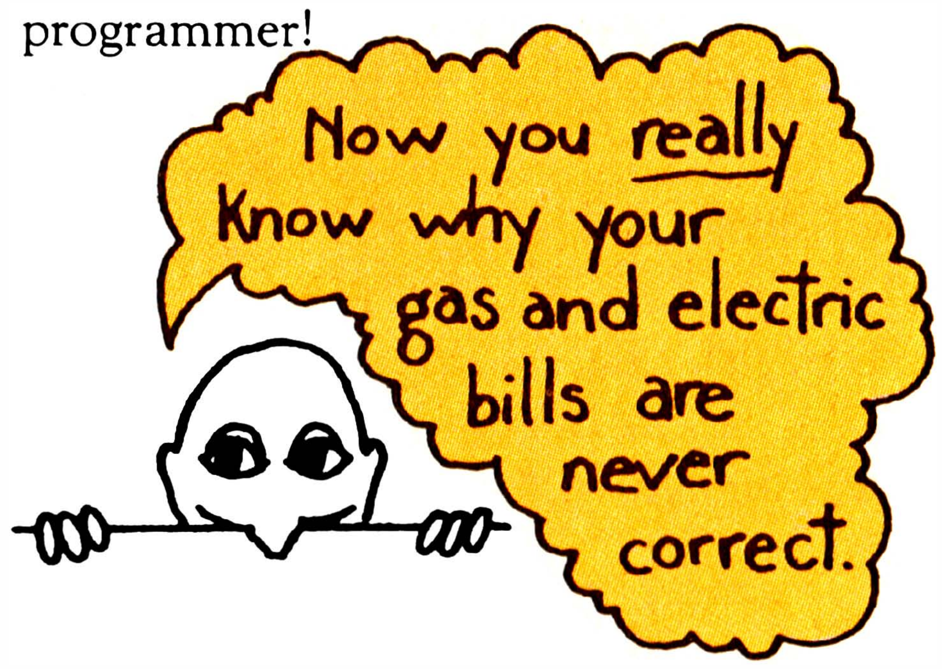
one space

Play several times. An average of 10 is fairly fast. Congratulations! If your average is more than 20, well . . . maybe you are thinking about something else.

We played the game several times and discovered a way to cheat. We can stop the computer with a count of 1 every time! We can do this *not* because we are that fast, but because there is a flaw in the program.

Beat the computer! Figure out how to stop the computer at 1 every time, just by pressing the space bar.

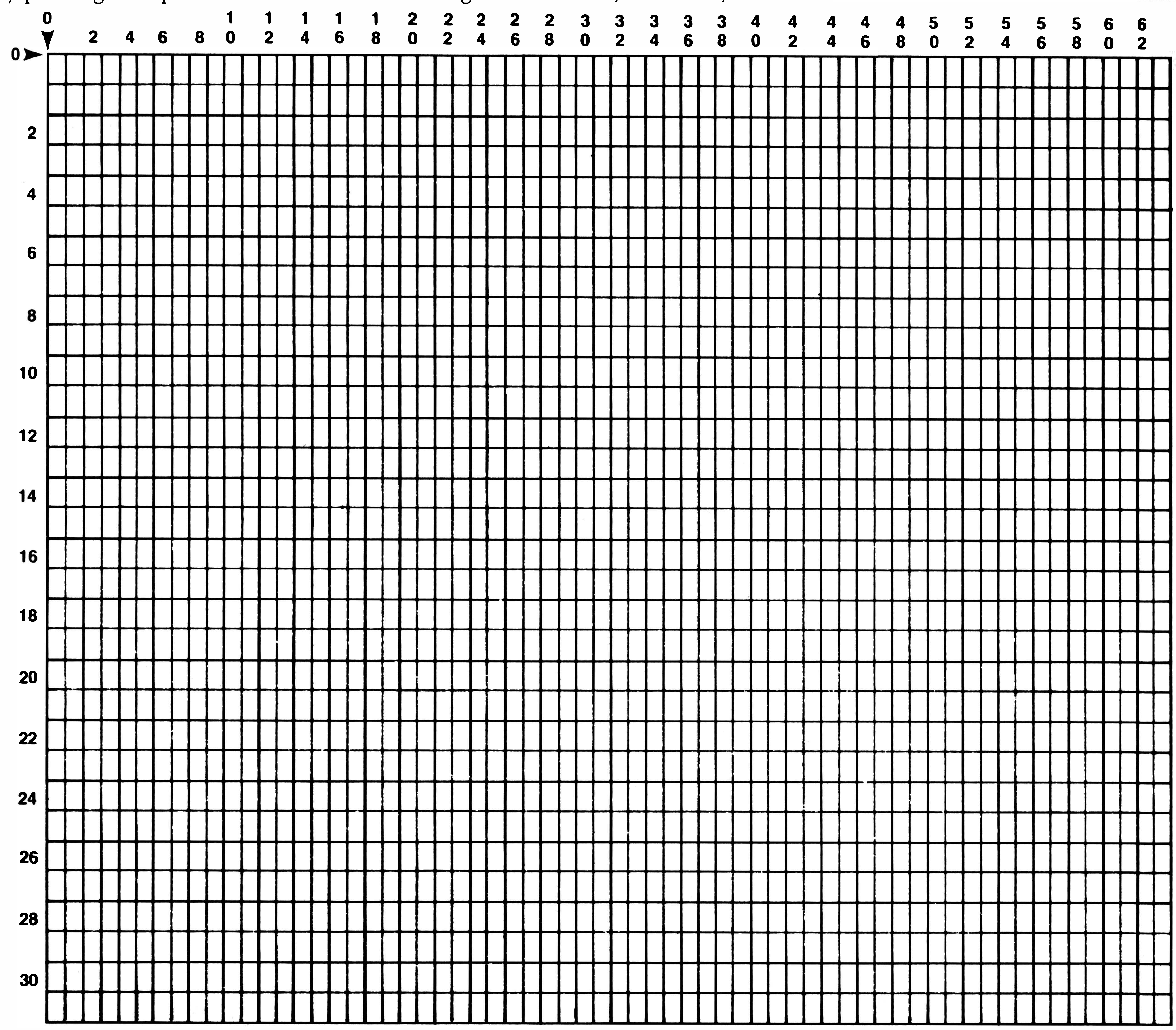
Important Notice!
This computer error is not the fault of the computer. Rather, as are almost all computer errors, it is the fault of the programmer!



Help!

What would you like to see in "My Computer Likes Me"? Send requests to George and Ramon, POB 310, Menlo Park, CA 94025. (The home of ComputerTown, USA!) If you want a reply, enclose a self-addressed, stamped envelope. If you like this stuff, please tell us. If you don't like it . . . (sigh), we need to know that too. Help us improve by being specific and constructive. See you next month. □

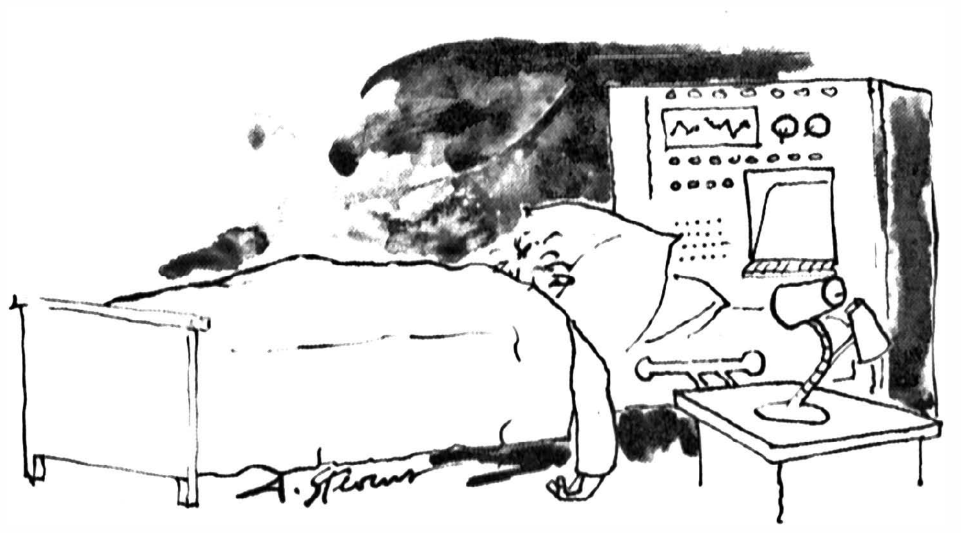
George Firedrake (alter ego of Bob Albrecht) and Ramon Zamora are regular columnists for Popular Computing.



A map of the Color Computer screen. Use this map (or a copy of it) to plan your next graphic masterpiece. Then use what you've learned about BASIC to make it a reality. . . .

Tomorrow's Computerized Days

by Dennis Briskin



6 A.M. In the half-sleep of dreaming I hear a soft feminine voice whisper through my pillow speaker: "You easily and effortlessly recall your dreams in vivid detail. Tell them to me." As I describe my dreams, the words, pauses, and breathing sounds are taped for later analysis by the Dreammaker program. "Thank you," the voice says.

6:10 A.M. Gentle flute music awakens me. "Good morning, Dennis," says the cheery, intelligent voice I have nicknamed Ramona. "Today is Thursday, October 14th, 1992. Please grab the body monitor bar."

I roll over and wrap my palm around a metal bar attached to my night table. The bar unit records my resting pulse, body temperature, and blood pressure, which is then analyzed as part of my health program. This morning I want the readouts and their meaning. "Results, please."

"Results. Yes." Ramona understands and responds to several hundred commands, as well as most nonidiomatic English.

"Your resting pulse is 48, body temperature is 98, blood pressure is 108 over 62."

"So?" I say, cuing the significance/interpretation module.

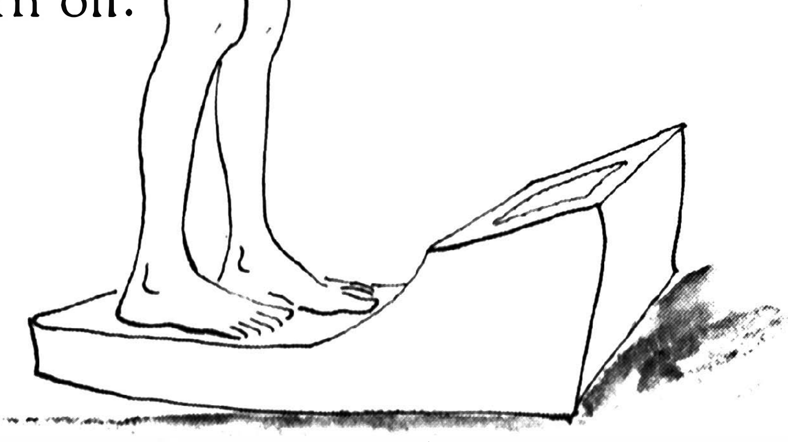
"Resting pulse directly indicates cardiovascular fitness," she says. "As your fitness improves, your resting pulse decreases. Do you want to know more?" At my command Ramona will give an ever-more detailed explanation, a customized lecture on any subject.

"No, thanks," I say. "How am I doing?", a code phrase for the comparison/evaluation loop. After a pause Ramona replies:

"You are three days ahead of schedule for the December 5th Honolulu Marathon. Your low resting pulse shows good c-v fitness with no excessive fatigue. Your temperature shows you're resting deeply and free of infection. Your blood pressure is slightly below your established healthy norm and suggests a minor problem. Would you like to know what to do?"

"Thank you, no." I know I am mildly dehydrated, which causes my blood pressure to drop. "Take a break," I say, putting the unit into a low-energy pause.

I get out of bed and enter the bathroom. Heat and motion sensors detect my presence and provide only enough light for walking around the carpeted bathroom. As I move from sink to closet the sensors adjust the light level. When I leave the room the lights turn off.



6:30 A.M. I stand naked on the scale. "How's my weight?"

"OK. At 134 pounds it is one pound low. You may eat an extra 250 calories before 2 p.m. today. Next?" I smile, anticipating an extra large dessert with lunch. The unit correctly interprets my silence as meaning "Nothing. Standby."

Back in the bedroom I don my robe and walk to the remote console and screen. "Hello and good morning," I say. "Overnight messages?"

"None. Normal schedule for now. Time to meditate.'"

Hmm, another peaceful night. The unit keeps me from cluttering my mind with trivia or routine items that can wait.

"OK. Meditation, please."

The meditation monitor schedules

the duration and type of meditation according to a prearranged schedule based on my stress level and progress.

As I sit quietly, eyes closed, and focus on my breathing, the unit does some of its best work. It monitors all security, utility, and communication functions in the house. It even summons emergency assistance if I fail to communicate at certain intervals. It stores messages and inquiries until I demand them. It also files public information (what used to be called "news" and "advertising") on color videotape.

After 20 minutes a series of tones returns me to normal waking consciousness. I dress for my morning run based on the unit's weather report. On this clear, slightly brisk day I put on a thick T-shirt. Around my waist I strap a lightweight, dual-track heart monitor/tape recorder. One track picks up my heart rate and transmits it back to the base unit. The other track connects to a lavaliere microphone strapped loosely around my neck, enabling me to record ideas. Next year promises the introduction of direct recording off the brain track, controlled by thought command.

Once dressed, I stretch while talking to the unit. "What's up today?"

"You have light meditation and brisk exercise, followed by breakfast. Then you have sedentary creative, brief rest, light routine, moderate human contact, lunch, sedentary routine, moderate human contact, solitary creative or solitary research, afternoon meditation and light rest, dinner, and moderate to heavy entertainment with early, long rest."

"Early rest? Why?"

"Tomorrow is a heavy exercise day followed by brisk creative. The evening is good for intense human contact."

"Which one?" I ask, hoping she'll loop to the human not the creative project.

"Carla," she says. "It's the third date."

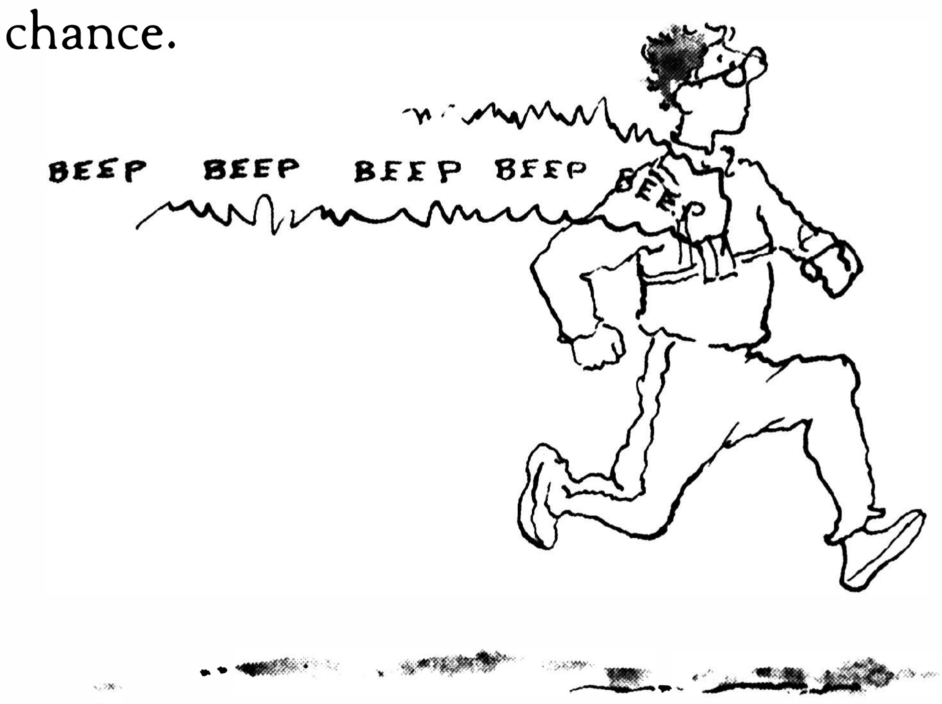
"OK. What kind of run today?"

"Ten kilometers, brisk pace, on paved roads."

"Target time?"

"Thirty-seven minutes."

That *is* brisk. The custom-designed marathon-training program schedules each run for length and intensity. While early versions could only tap out a constant pace, the new edition provides slow warm-up pace, a steady beat at the target pace, followed by a gradual slowing at the end. Nothing is left to chance.



7 A.M. I head out the door, which locks behind me, and turn on the monitor/recorder. I jog slowly to the beep tone of the unit. After two miles I'm breathing hard but not straining. I take a moment to talk into the microphone: "Remind me to do a 2000-word personality profile for *Small Businessman* magazine on freelance photographer Rod Silver. His quote on the value of self-discipline and intuition will make a great opening."

Back home I press my palm against the special security pad on the back door. The sensor recognizes my scent and palm prints and orders the door to unlock. I stretch again, take a quick shower, dress, and am ready for breakfast.

In the kitchen, Ramona asks: "How hungry are you?"

"Mmm. About a 7, I guess."

"What do you feel like eating?"

"I want orange juice, cereal, yogurt, and fruit. And coffee."

I look at the menu printer to see what she has worked out for me. For each meal of the day, the unit plans a balanced meal based on my hunger level and desires. It also records what I eat and how much, by means of a digital scale with a 10-key pad for entering food codes. While the computer can't prevent me from splurging, it is a reminder of calories eaten versus calories burned off. If I overshoot my daily caloric limit, the unit adds a few miles to the weekly total in order to keep me from gaining weight.

While I eat, the unit plays music to relax me. Later, as I wash dishes and clean up, the unit reminds me: "After breakfast you have sedentary creative." "Thank you. I'm on my way."

I go to my office, which houses keyboard, video-display screen, the computer and mass-storage units, a random-access videotape cassette player, letter-quality printer, and speech synthesizer. The entire system is connected to its own data- and voice-transmission line. As I sit down, the screen flashes "Hello, Master. How are you?"

"Wonderful," I say. "And ready to go. What's up today, Ramona?"

"You are approaching deadline on three articles, two photo requests are pending, three letters must be written today, and your own sales letter needs to be finished."

"What's the best way to use my time?"

A slight pause while the unit calculates and compares the cost, return, and priority of each project. Finally her voice comes back: "Write the guest editorial for *Popular Computing* magazine. Then write letters. Answer photo requests. Leave the other two articles for the afternoon. The sales letter can be postponed until tomorrow."

"OK, *Popular Computing* it is. Give me a profile on the magazine." Culling data from my own files and from standard references, the screen displays the information I need to tailor the editorial to the readership—their educational level, age, sex, special interests, even the way they like their articles to begin and end.

As I work on the editorial I search my clip files plus the library services for facts and quotes from other writers. Once I tell Ramona what I need, she initiates the search while I continue writing at my thought-processing station.

When I complete the editorial, I type CHECK. In addition to checking spelling against a 150,000-word dictionary, the computer measures readability by counting sentence lengths, paragraph lengths, and words by syllable length and familiarity. All deviant items are displayed for me to correct. When I'm

satisfied the article is complete, I type STORE and SEND, along with the magazine's electronic address. The unit keeps a copy for me and transmits my final version, along with billing information, to the magazine. When the magazine's computer receives the editorial and confirms the source and acceptance, it transmits payment from its bank account to mine, while sending me confirmation of receipt and payment.

Next I turn to the photo request. A travel magazine wants color slides from Upcountry Maui and Haleakala Crater. I type DISPLAY and SEQ and the video tape player flashes my slides chronologically. As I select which slides to submit, the unit electronically parks the chosen images in temporary storage.

When I have assembled the entire batch, I type SEND, along with the magazine's electronic address. The unit transforms color images into pulses that the magazine's color receiver retranslates into standard television pictures. As a security measure, the images cannot be off-loaded until I transmit a code release on receipt of a purchase order or final payment.

While I am sending the photos, a series of reminders crawl along the bottom of the screen. "Ten minutes to morning break . . . Calls waiting: business, personal . . . Choose birthday present for Sonia Lawrence . . . Other low-priority items available."

I decide to take the business calls. I push the PHONE button and the screen shows me the caller, the editor of a major men's magazine. After we exchange pleasantries, he says: "We have a project in mind for you. How's your schedule for the next two months?"

"Just a moment, I'll look. Ramona, 90-day schedule display, please, with deadlines." The editor's picture fades and the screen shows all my commitments and deadlines for the next three months, color-coded by priority and flexibility. I can continue to talk with the editor while looking at the schedule.

"I have ten consecutive days free just before Thanksgiving, plus about a week in mid-December. What's up?"

"We need a survey of Bahama hotels and restaurants during peak season," he says. "You interested?"

"Of course. You want pictures, too?"

"Sure. Take a mini-cam and a 35 still camera."

"I'll need an assistant," I say. "And expense money. And half the fee in advance."

"No problem. Just get us the article and images before Christmas, OK?"

"You got it," I say. "And Happy New Year to *you*. Bye."

I press the disconnect button and say, "Ramona, plan me a trip." As I give her the details of the assignment she scans airline, hotel, restaurant, and rental-car prices, and makes reservations. Where necessary, she sends advance payments to take advantage of discounts and special offers and modifies my schedule to account for this change. And she searches the available pool of assistants to see who is free for two weeks in the sun.

11:15 A.M. The display screen slowly fades as Ramona says: "Time for human contact. Talk to your neighbor." The computer controls the type and frequency of contact so I don't miss my minimum daily requirement.

I get up from the work area, walk downstairs, and go out the back door. As I approach the fence I see my neighbor, Ted, approaching. His system has the same Human Contact program. We sometimes kid about our four-way friendship.

11:45 A.M. Lunch. Again the unit chooses my meal based on my hunger, preferences, and nutritional needs. It reminds me I can have extra dessert.

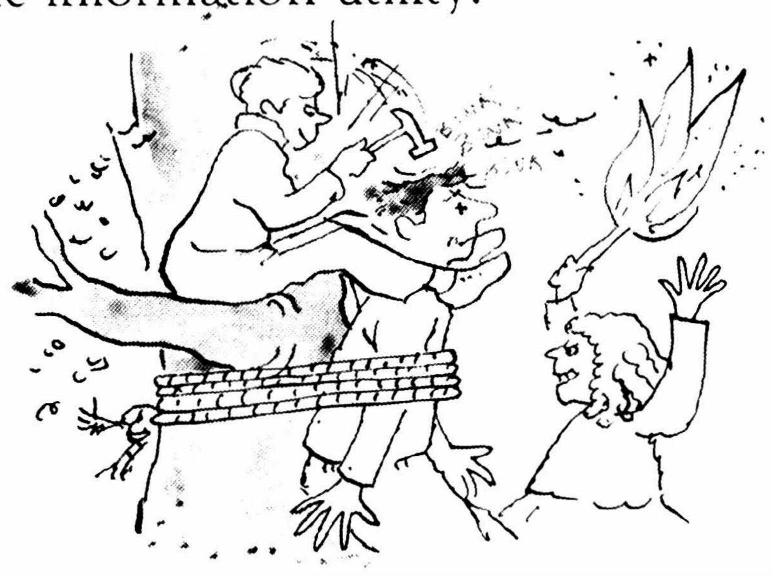
12:45 P.M. I settle into an easy chair in the living room. The unit counts me down into a nap.

1:00 P.M. A gentle tone awakens me and I return upstairs to handle my routine items. Soon the screen trails an announcement from Bullock's department store. They have received a shipment of knit shirts and they have the gold color I want. The video display shows me a sample. It looks right and I order two. The screen asks me to indicate "pick up" or "deliver." Using the light pen, I touch the box next to "deliver" and the screen responds: "Your neighborhood distribution center will notify you of receipt. Thank you."

The unit vastly simplifies shopping. I know instantly whether or not I can afford something and the Budgeteer software prevents me from spending money I don't have. In fact, the software paid for itself in less than a year by eliminating high interest rates on consumer loans. Retailers don't like it, but I control my spending, save and invest on schedule, and avoid impulse, budget-busting buying.

1:35 P.M. I dial the latest public information, all preselected by category. As I scan the information, including pictures, sound, and text, I push the "SAVE/FILE" button for any thing I want to keep in personal storage.

That's a luxury, since it's always available (for an extra charge) by calling the information utility.



2:15 P.M. The unit reminds me it's time for human contact again. I've set a date to visit neighbors, a young couple with two children.

3:15 P.M. My wrist unit beeps, reminding me to return for creative or research work. Again I check with the memory to decide on the best use of my time. For the next two hours I answer mail electronically, make calls, insert several articles into the computer memory, and research a future project.

5:15 P.M. "Time for afternoon meditation."

"Thank you. I'm ready for it. This has been a long day."

"Oh?" Ramona says. "Are you feeling tired?"

"A little, yes."

"Did something happen today that was not OK?"

I think for a moment, reviewing the day in my head. Ramona has switched automatically into the Clearing/Counselor mode at the first sign of my discomfort. Normally I would not be tired at 5 P.M.

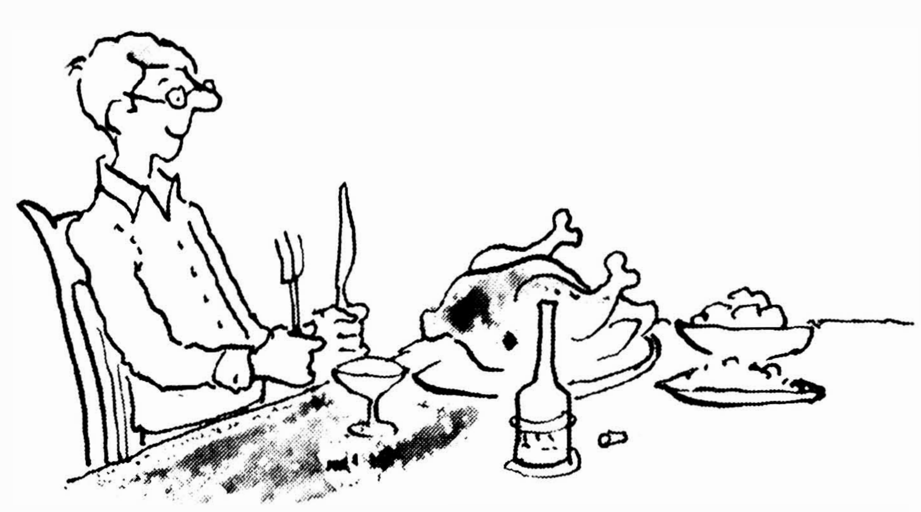
"Well," I say, "I'm not totally pleased about the Bahama assignment."

"Oh? Why is that?"

"I want to go, and it should be fun and profitable. But I had hoped to spend that time doing nothing."

"I see. Is there anything else that was not OK?"

I talk with Ramona until I have expressed everything I can think of. Soon the tiredness is gone.



6:15 P.M. Dinner. "What do you feel like eating?"

"Chicken, vegetables and rice," I say.

Quickly the printer provides a suggested menu. As always, I am free to deviate, although I rarely do. After some initial resistance to the idea of "having my life controlled by a machine," I settled into an easy routine with the computer. It knows my preferences and usually gives me what I want while helping me avoid what is harmful or wasteful. In the rare cases when we disagree, I'm the boss, since the computer's ultimate mission is to serve me. And except for emergency alerts, I can always override it or ignore it.

7:15 P.M. Entertainment and education time. Sitting in a comfortable chair, I review the menu of films, videotape, or still photographs on my wall screen.

"Ramona, what's on my educational priority list?"

"Work-related or personal?"

"Personal. I've had enough work today. Hey, what's in astronomy?"

The screen lists a number of interactive educational programs on astronomy. I choose one on Venus, the first bright object I see in the western twilight, and spend the next hour leafing through viewing sections, all controlled by computer. Occasionally the tape stops and the screen flashes questions on what I've just seen and heard. I answer by pressing a numbered key corresponding to my chosen answer.

8:15 P.M. I pass the rest of the evening with a novel in good old-fashioned book form. I love the feel of paper, and the musty smell of an old book, a vestige of the old times.

10 P.M. Ramona chimes in: "Bedtime." The house is automatically secured as I crawl into bed and Ramona counts soothingly until I fall into a deep sleep. □

Dennis Briskin is a freelance writer living in Palo Alto, California.

Illustrations by Austin Stevens.

Book Reviews

The Micro Millennium

Christopher Evans
Viking Press, 1980, 255 pages
hardcover $10.95; Pocket Books, 1981
softcover $3.95
Reviewed by Beverly Cronin

Books about computers can be divided into two categories: those that can be understood by readers of average intelligence and those whose meaning and message escape all but computer science PhDs.

The Micro Millennium by Christopher Evans belongs to the first group. True, it is a book about computers, but more specifically, it's a book about the future. In it Evans daringly predicted how the future will unfold as the "Computer Revolution" (his term) sweeps down upon us and changes our way of life drastically over the next two decades. With the publication of the softcover edition, it's time for a second look.

When *The Micro Millennium* was published in 1980, critical response ran from one end of the spectrum to the other. Ray Bradbury, author of numerous science-fiction sagas, greeted the book with enthusiasm: "Good man, Evans, to write as he does . . . . This is a sane book that will drive some readers mad." At the other end, *Business Week* reviewer Margaret Coffey wrote: "In sum, Evans' book is essentially an enthusiast's expression of wishful thinking that borders on science fiction. Taken with a liberal grain of salt, it should serve as a good introduction for the general reader."

It is more than a "good introduction." It is an intelligent projection of the way things might be in 1999 based on the way they were in 1979. It is, if you will, a futuristic version of the educated guess. And it's an optimistic look at a world—our world—in which computers will play an increasingly central and crucial role.

Sadly, Evans won't witness the changes he predicted and welcomed. He died in October 1979, shortly after completing *The Micro Millennium*.

Evans sliced the future into three segments: short-term, 1980-1982; middle-term, 1983-1990; and long-term, 1991-2000. His short-term predictions have largely withstood the test of two years' time—a long haul in a field where last week is the Dark Ages.

Drawing upon his background as a computer scientist and experimental psychologist, Evans made these short-term predictions: a continued reduction in the cost of microcomputers, the size of their memories, and the central-processing units, with a concurrent increase in capacity, speed, and power. As a result of that, he saw wide-ranging applications such as voice-controllable computers, computer-controlled carburetion in medium-priced cars, and the use of small home computers to handle such mundane necessities as filing cooking recipes, telephone numbers, and keeping track of household finances.

In other areas, Evans' crystal ball misled him. For example, he wrote, "in hospitals and clinics computers will screen patients before they see a doctor." Not yet. Patients are still greeted by a hospital worker, who in turn probably feeds all their vital medical statistics into the hospital's computer network.

As well, Evans gave IBM's planners too little credit: "Having built their strength on a policy of long-term maintenance contracts, IBM appears to be totally committed to the manufacture and distribution of big systems—'mainframes' to use the trade term—and to have missed out on both minicomputers and microprocessors. If this is so then the rocketing rise of IBM may come to a halt in the near future." The debut of IBM's Personal Computer last August disproved that prediction.

The driving force behind the Computer Revolution is the almost magical power of the microprocessor. Able to compute complex equations on a single command, operate faster than the mainframes of yesteryear, and store more information than your home library, the microprocessor is the superman of the computing world. Developed just seven years ago, it has completely reshaped the face of computer technology and aimed the industry in myriad new directions.

Evans believed the Computer Revolution would affect our lifestyle more drastically than the cumulative, global effects of the discovery of navigational techniques, the invention of the printing press, and the onset of the Industrial Revolution. Computers amplify and emancipate the power of man's brain just as machines supplemented and amplified the power of man's muscles. But whereas the changes brought about by the Industrial Revolution took place relatively slowly, spanning an entire century, the changes initiated by the Computer Revolution will occur at lightning speed.

To emphasize just how dramatically changes have evolved in the computer industry, Evans drew this analogy:

> *But suppose for a moment that the automobile industry had developed at the same rate as computers and over the same period: how much cheaper and more efficient would the current models be? If you have not already heard the analogy the answer is shattering. Today you would be able to buy a Rolls-Royce for $2.75, it would do three million miles to the gallon, and it would deliver enough power to drive the* Queen Elizabeth II. *And if you were interested in miniaturization, you could place half a dozen of them on a pinhead.*

What of Evans' other predictions about a cashless society; the absence of crime by the end of the century; a world without books; the decline of the professions such as law, medicine, and teaching; and the restructuring of the workplace, with people conducting business from their homes via computer networks? They're interesting to speculate on, but only time will tell.

Of more serious import is the concept of the Ultra-Intelligent Machine—"a computer programmed to perform any intellectual activity at least marginally better than Man." And when we get the UIMs (presumably amiably disposed toward humans), what do we do with them? Evans said, "clearly . . . put them to work on some of the numerous problems facing society." Pragmatic, indeed. But, one wants to say, how will people *feel* about machines that are more intelligent than they are? I suspect Evans underestimated his fellow men and women when he suggested that "even the most optimistic fan of human beings will admit that our world is in a most dangerously muddled state, and Man, unaided, is unlikely to be able to do much to improve it." Man did improve and is, in fact, improving his lot unaided. How else did we get this far?

How seriously should we take this book that dares to predict our future? Quite seriously, I believe. As Charles Kettering said, "We should all be concerned about the future because we will have to spend the rest of our lives there."

Nailing Jelly to a Tree

Jerry Willis and William Danley, Jr.
Dilithium Press, 1981, 244 pages
softcover $12.95

The BASIC Handbook

David A Lien
CompuSoft, 1981 (2nd ed.)
480 pages, softcover $19.95
Reviewed by George Stewart

Free computer programs abound in number—just look in any computer magazine or in any one of the many books with titles like *100 BASIC Programs* or *1001 Games*. But getting the program to run on your own personal computer is another matter. That the program is written in BASIC is no guarantee it will run on your BASIC computer because every computer understands only its own dialect of the language.

Nailing Jelly to a Tree and *The BASIC Handbook* are both intended to help you convert and modify BASIC programs to run on your computer. The similarity between the two books ends right there, however, so rather than mix good bread with bad jelly, I'll treat them separately.

According to the authors of *Nailing Jelly*, learning about software is like trying to nail jelly to a tree: difficult if not impossible, and always messy. To a beginner seeking information and guidance, that analogy is misleading. To a programmer who takes pride in his work, it's an offensive comparison. If programming is to bear any useful results—in an application or as an educational activity—it must be pursued as a logical, careful, and well-planned process, not as a messy task.

As if to justify the book's title, the authors make the subject of converting programs exceedingly difficult. The first half of the book is devoted to technical concepts and practices (machine language, assembly language, memory maps, operating systems); this information is, at best, peripheral to the needs of someone trying to convert a BASIC program. A narrative introduction to BASIC takes 36 pages. Another 68 pages are devoted to converting BASIC programs. The information is adequate—it's just not well focused for a reader seeking "how-to" information. The authors could have made more progress toward their goal by assuming that the readers have *some* familiarity with their own computer's BASIC. (If they don't this book will be quite insufficient in any case.)

Unlike *Nailing Jelly*, *The BASIC Handbook* is an extremely useful tool—easy to use, well conceived, and above all, comprehensive. The book consists of an alphabetical listing of almost 500 BASIC words used in over 250 computer models. Each of these "key words" gets the full treatment:

- the word and its variant spellings
- an indication of whether or not the word is part of ANSI BASIC (the standard for minimal BASIC, defined by the American National Standards Institute)
- a general explanation of the word
- a test program so that you can find out how your computer interprets the word
- programming hints and special uses
- ways to get the same results if your computer doesn't "know" the word
- variations in usage
- extensive cross-referencing to other words in the encyclopedia

With all this information packed into each entry, it's easy to see why the book is 480 pages.

In researching the personal-computer field to prepare the second edition, author Lien says he traveled four continents. As a result, he is able to include such entries as British and Swedish computer dialects of BASIC. The listings are so comprehensive and the book has so much to commend it that I can only suggest you go to your local computer store and take a look for yourself.

One final note: unlike most computer books, this one has an excellent design. It's the kind of volume you can't resist flipping through and, for a book designer, that's the ultimate compliment.

The First Computer Design Coloring Book

Stanley Baxendale
Harmony Books, 1979, 85 designs
softcover $4.95
Reviewed by Rachael Wrege

Get out your colors, graphics buffs! This cheerful coloring book is tailor-made for those of us still battling the urge to delve into the kids' Crayolas.

Written and designed by Stanley Baxendale, *The First Computer Design Coloring Book* features 85 computer-generated illustrations. Its eight sections highlight such designs as logarithmic spirals, tessellation (tiling on planes), kaleidoscopes, spherical mapping, and variations on traditional Japanese motifs. The designs, which were programmed in BASIC on a desktop Tektronix 4051 computer, are detach-

able for display after coloring.

Each section includes a brief explanation of how the designs were created and how different techniques (such as logarithmic curves) are used in other fields. These explanations are the book's only flaw; the author can't seem to decide what age reader he's trying to reach. While some of the technical explanations are too difficult for a child to understand, other sections of the book are aimed at children under 10.

I read the technical sections myself, explained them to the kids, and finished the graphics lesson by letting them color some designs. Then I packed them off for a nap, grabbed the fuchsia and gold crayons and indulged myself.

Indulge yourself too. *The First Computer Design Coloring Book* is pure fun. fun. □

New Products

Human Factors in Office Automation

Q.E.D. Information Sciences has published a book on factors that must be considered in designing offices and information systems. *Human Factors in Office Automation*, by Wilbert O. Galitz, provides guidelines for systems, keyboard, and display screen design, data collection techniques, and causes of and remedies for human operator error.

Human Factors in Office Automation also covers work station design, office layout, light and sound levels with behavioral responses to them, individual and group behavior with regard to privacy and performance, and an analysis of formal and informal communications. The book costs $9.95 from Q.E.D. Information Sciences, Inc., 180 Linden St., POB 181, Wellesley, MA 02181, (617) 237-5656.

Circle 200 on inquiry card.

Easier Electronic File Management

Personal Software's Visifile progam can ease your file-management (record filing, searching, sorting, printing reports and mailing labels) headaches. Visifile can be used for inventory, client lists and records, sales information, medical records, and other textual or numerical data. Its Flexformat feature allows you to change, rearrange, and add information to records or combine business records into new files. Information entry is simple and lets you design an entry form on the screen for easy input. All reports can be set up easily and saved with Visifile. Calculations, including column totals, can be handled in reports. Visifile can communicate with Personal Software's Visicalc, Visiplot, and Visitrend/Visiplot programs, and Visifile records can be transferred over telephone lines with the aid of the Visitrend program.

Visifile runs on 48 K-byte Apple II or II Plus popular computers with one disk drive. The suggested retail price is $250. Contact Personal Software, Inc., 1330 Bordeaux Dr., Sunnyvale, CA 94086, (408) 745-7841.

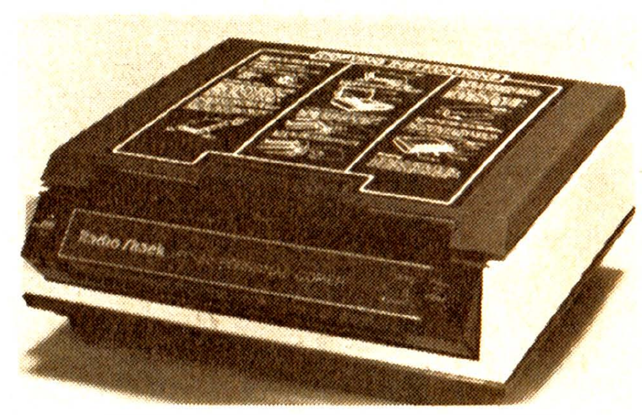
Circle 201 on inquiry card.

Sales Tax Calculator

Manhattan Software has announced its TRS-80 Sales Tax Calculator. It's designed for small businesses that must file quarterly state sales tax reports. The program automatically separates taxable from nontaxable entries, calculates and displays the tax on screen, and adds sales categories and tax due. You can enter tax actually charged on each sale and, to make your work easier, entries can be made once a week or month, saved on cassette tape, then retrieved later for additional entries.

Sales Tax Calculator holds up to 500 entries in 16 K bytes of memory or 1500 entries in 32 K. Immediate editing of entries is allowed, and edited entries and totals are shown corrected on the screen. The data can be printed out with summary and individual entries in page format for your permanent records. Sales Tax Calculator costs $14.95 and comes on cassette for the TRS-80 Models I and III. Contact Manhattan Software, POB 1063, Woodland Hills, CA 91365. Visa and MasterCard holders can call (213) 704-8495.

Circle 202 on inquiry card.



Portable Copier

Radio Shack's new PC-50 Personal Copier is a low-cost portable copier that produces black images on standard 8½-by 11-inch paper. The PC-50 weighs only 8⅕ pounds, so it's light enough to carry as a briefcase. It works with a dual-spectrum process that uses no liquids, powders, or other chemicals, so you get dry copies every time. The PC-50 costs $149.95. Contact Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102, (817) 390-3300, for more information.

Circle 203 on inquiry card.

Get Yourself into Hot Water

Sunheat1 is a computer program to help you plan and evaluate a solar hot-water system. Using Sunheat1, you can find out how various solar collectors, heat exchangers, preheat tank sizes, and hot-water tank sizes affect the amount of useful solar energy available from a system. Sunheat1 helps you determine the best tilt angle for the collector and the best type of collector and heat-transfer fluids to use within the collector. Sunheat1 is customized for your location using data on average temperature, cloudiness, and available solar energy. Typical hot-water usage can be selected. The program calculates the amount of solar energy that can be collected each month and the percentage of your hot-water needs that can be supplied by solar energy on a monthly and yearly basis.

Sunheat1 is written in BASIC and runs on 16 K-byte TRS-80 Model I Level II or Apple II Plus systems. Available for $19 from Solartek, POB 298, Guilderland, NY 12084.

Circle 204 on inquiry card.

Desktop Computer Sports Full Graphics

North Star Computers' new Advantage integrated desktop system has full-graphics capabilities. Advantage features two 5¼-inch high-capacity floppy-disk drives, 64 K bytes of RAM, an 87-key typewriter-like keyboard, and a 12-inch, green-phosphor, nonglare video-display screen. Its high-powered graphics feature is driven by an additional 20 K of video RAM, which supports high resolution and can produce bar charts, pie diagrams, plotted graphics, and three-dimensional visuals.

Software for the Advantage includes random-file management, accounting, and general ledger programs. Priced at under $4000, the Advantage is available from North Star Computers, 14440 Catalina St., San Leandro, CA 94577, (415) 357-8500.

Circle 205 on inquiry card.

Listen to Your Computer

Your TRS-80 Model III will be silent no longer with the AD-III audio amplifier from TCS Systems. The circuit-on-a-board plugs into your Model III with just six connections. It lets your computer generate sounds and music through a 1-watt speaker, which is included. The AD-III costs $19.95. Contact TCS Systems, Division of Thomas Engineering, Rte. 4, Box 12A, Lake City, FL 32055, (904) 755-3599.

Circle 218 on inquiry card.

Castle Wolfenstein—Action Adventure

Castle Wolfenstein is an action-adventure game that puts you in the role of a captured Allied soldier during World War II. You are a Nazi prisoner of war, and you've been brought to Castle Wolfenstein for interrogation. A dying cellmate slips you a loaded pistol. You know that you must find the Nazi war plans hidden in the castle and escape without being recaptured or shot by the dreaded SS. Successful escapes are rewarded with a promotion and a new castle to crack.

Castle Wolfenstein uses game paddles, a joystick, or the keyboard. It has animation and sound effects, including jackboots clicking, doors opening, guns firing, and shouts in German. Games can be interrupted, saved, and picked up later on.

Castle Wolfenstein requires an Apple II or II Plus with 48 K and DOS (disk operating system) 3.2 or 3.3. Documentation is included in the $29.95 price. Castle Wolfenstein is available from Muse Software, 330 North Charles St., Baltimore, MD 21201, (301) 659-7212.

Circle 206 on inquiry card.

Aid for Doctors

Doctors can use a TRS-80 Model I or III and the Medical Office Management program to maintain patients' files, schedule office appointments, print daily transactions, create procedure-by-procedure management reports, prepare and print patient bills, and prepare insurance claim forms. The program maintains 10,000 active-patient records, and appointments can be scheduled up to 40 months in advance. Approximately 190 patients per physician per day and up to 600 transactions per day can be handled.

The billing system keeps track of daily and mail payments received, cash in, credit-card usage, bank deposits, and patient bills. It can prepare third-party claims forms and monthly reports plus maintain and bill past-due balances.

The Medical Office Management program requires a Model I or III, a disk system with at least two drives, and a 132-column printer. It costs $449.95. Contact Charles Mann & Associates, Micro Software Div., 55722 Santa Fe Trail, Yucca Valley, CA 92284, (714) 365-9718.

Circle 208 on inquiry card.

Computer Books and Programs

Books on a wide variety of computer-related topics, including computers in math, society, music, and business, are contained in Entelek's new catalog *Computer Books & Programs*. Many of the books feature extensive program listings, some of which are available on disks for TRS-80 and Apple computers. For your free copy, write Entelek, Ward-Whidden House/The Hill, POB 1303, Portsmouth, NH 03801.

Circle 209 on inquiry card.

Products for the Apple

The Computer Station has published a free catalog of its hardware and software products for the Apple Computer. Products listed include graphics and communications software, video-imaging hardware, and accessories. For your free copy, contact Computer Station, 11610 Page Service Dr., St. Louis, MO 63141, (314) 432-7019.

Circle 210 on inquiry card.

Circle 26 on inquiry card.

Searching for Software?

The revised and expanded edition of the *Reference Manual for the Instructional Use of Microcomputers*, volume 1 is now available. The *Manual* assists educators in locating, selecting, and integrating courseware into the elementary, secondary, or university curriculum. The book includes an index of educational programs cross-referenced according to subject area and grade level and lists of publishers and distributors of educational software. Evaluations of more than 200 representative programs, descriptions of peripherals and options for the Apple II, an index of books, magazines, and journals relating to microcomputers and computer literacy, and a selection of forms and guidelines for the evaluation of microcomputer courseware are provided. The *Reference Manual for the Instructional Use of Microcomputers* costs $75. Contact Jem Research, Discovery Park, University of Victoria, POB 1700, Victoria, BC V8W 2Y2, Canada, (604) 477-7246.

Circle 211 on inquiry card.

Computerized Rubik's Cube

Magikube is a computerized cassette version of the popular brainteaser Rubik's Cube. You can scramble the cube yourself or have your TRS-80 Color Computer do it for you. The objective is to restore the cube back to its original state. Magikube has a tape-save feature that allows you to save your cube and continue later. Magikube costs $19.95 and is manufactured by Computerware, 1512 Encinitas Blvd., POB 668, Encinitas, CA 92024, (714) 436-3512.

Circle 212 on inquiry card.

Apple-Cat II

The Apple-Cat II is an LSI (large-scale integration) modem that converts your Apple II or II Plus popular computer into a functional telephone, complete with a handset for use with rotary-dial phones. The Apple-Cat will automatically answer, dial, re-dial, and disconnect a phone call. A few keyboard controls handle all dialing and answering functions. It features eight user-selectable transmission rates of up to 1200 bps (bits per second), software on a floppy disk, and a menu of 19 functions that are displayed on your computer's video screen. Each function can be activated by a single keystroke. Programming knowledge is not required because all operations are identified on screen.

Apple-Cat II offers a 45.5-bit-per-second, Baudot-coded, Weitbrecht modem that can be used by the deaf and hearing-impaired with TTYs (Teletypewriters) and TDDs (Telecommunications Devices for the Deaf). Along with the Baudot code, Apple-Cat II has the ASCII (American Standard Code for Information Interchange) cahracter set, which provides the ability to communicate with computers and ASCII-based equipment in addition to the mass of Baudot terminals in the deaf-communications network.

Apple-Cat II allows connection of any compatible peripheral, such as a printer, because it provides a separate serial RS-232C port. Apple-Cat II works with BASIC, Pascal, or CP/M. Available through authorized Novation distributors, Apple-Cat II costs $389. For details, contact Novation, Inc., 18664 Oxnard St., Tarzana, CA 91356, (213) 996-5060.

Circle 213 on inquiry card.

Circle 2 on inquiry card.

Time-Out for the Apple

The Symtec Real Time Clock adds independent timekeeping and calendar functions to any Apple II computer, plus the ability to control external devices or even turn the Apple on and off.

Provided with a two-year battery for accurate timekeeping even during power outages, the programmable device can issue interrupt messages to the Apple at intervals from $^1/_{10}$ second to months apart. Such interrupts could be used to tell the Apple that it's time to make coffee, water the lawn, etc.

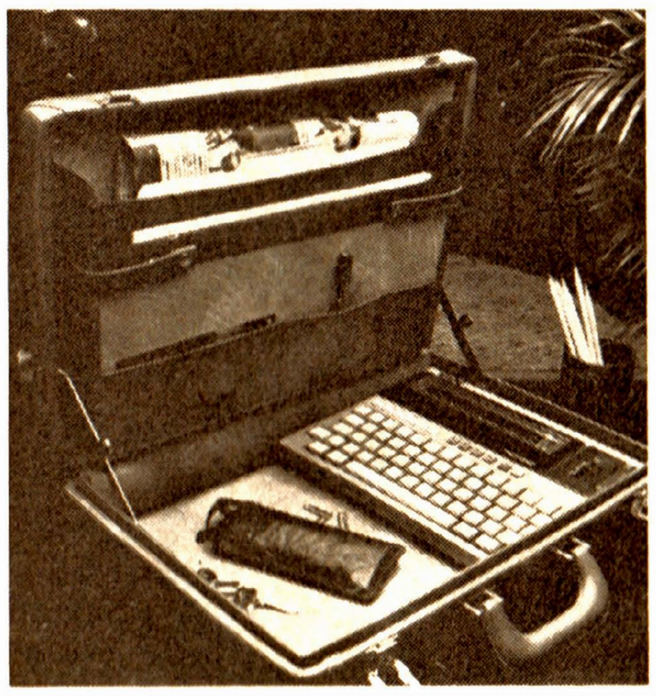
The Symtec Real Time Clock comes with software in ROM (read-only memory) and an instruction manual. The cost is $119.95. Contact Symtec, 15933 West Eight Mile Rd., Detroit, MI 48235, (313) 272-2950.

Circle 215 on inquiry card.

For Your Store

The Arba Register is a point-of-sale cash register that's capable of interfacing with most popular computers on the market. The Arba Register, an RS-232C-compatible device, has a keyboard, twin LED (light-emiting diode) displays, separate journal and receipt tapes, functional minus, and percentage discount and paid-out keys. Demonstration software illustrating computer-register inventory interactions and cash-register functions has been created. Demonstration software is available on 8-inch disks with CBASIC and on Apple DOS (disk operating system) 3.3 disks. Contact Arba Fine Business Computing Corp., Suite 315, 6340C Americana Dr., Willowbrook, IL 60514, (312) 749-7444.

Circle 216 on inquiry card.



The Typecorder

Two New Products from Sony

Sony Corporation has introduced two new products: the Typecorder and the Series 35 word processor. The Typecorder is a three-pound, portable work station that's battery driven. It fits in a briefcase and features an LCD (liquid-crystal display). It can read out and transfer data to a microcassette tape and can record voice for dictation and transcription purposes. The Typecorder will function as a word-processor, allowing text entry, editing, and output to a printer.

The Series 35 word processor features two 3½-inch Sony Micro Floppydisk drives and a video display. It provides full text-editing capabilities and is fully compatible with the Typecorder. For details, contact Sony Corporation of America, 9 West 57th St., New York, NY 10019, (212) 371-5800. □

Circle 217 on inquiry card.

In Other Words

Popular Computing's glossary defines the most common computer terms.

acoustic coupler: A mechanical device that allows a telephone handset to be connected to a modem (see **modem**). The term is sometimes used to refer to the entire modem.

address: A way of identifying any location in the memory of a computer.

application program: Software designed for a specific purpose (such as accounts payable or receivable, payroll, inventory, etc.).

ASCII: The American Standard Code for Information Interchange. The most generally used format for representing and exchanging textual information among computers. Under the code, each of 96 characters (letters, numbers, and symbols) is given a unique binary number code (1s and 0s).

assembly language: A means of communicating with a computer at a low level. Assembly language lies between high-level languages (such as BASIC and Pascal) and machine language (the 1s and 0s the computer understands at its most basic level). Programmers use assembly language to make efficient use of memory space and to create a program that runs quickly.

backup: An extra copy of software, normally kept on file in case the original program is damaged or lost.

BASIC: Beginner's All-purpose Symbolic Instruction Code. The most used high-level language for small computers.

baud: A measure of the speed at which data travels (normally between a computer and a peripheral or between two computers).

binary: A numbering system that uses only 1s and 0s. It is an efficient way of storing information in a computer since the hundreds of thousands of microscopic switches in the computer can only be on (1) or off (0).

bit: A binary digit (1 or 0).

bps: Bits per second. A measure of data-transmission speed showing the number of bits of information that pass a given point in one second. In small computers, the most common bps used is 300.

break: An interruption of a transmission. Most small computer keyboards have a Break key that tells the computer to stop what it's doing and wait for further instructions.

buffer: An area in the computer's memory used to temporarily store information. When using a printer, a buffer is needed because the printer operates much more slowly than the computer.

byte: A sequence of bits that represents a single character. In most small computers, a byte is eight bits.

CAI: Computer-Aided Instruction. Computers used to teach normally involve a two-way "conversation" between the student and the computer; the computer informs the student of mistakes as he makes them, and is able to respond to the student's demonstrated lack of knowledge.

channel: A path for the transmission of information between two points.

character: A single letter, number, or other symbol. In a small computer, a character is normally represented by eight bits (one byte).

chip: A generic term for an integrated circuit (IC), a single package holding hundreds or thousands of microscopic electronic components. The term comes from the slices (chips) of silicon of which they are composed.

clock: In a small computer, a repeating signal (usually in the range of millions of cycles per second) that controls the microprocessor "brain." Each time the clock sends a pulse, the computer performs a single task.

command: A word or character that causes a computer to do something.

compiler: A piece of software that takes a series of commands written in a high-level language and translates them into a lower-level language more efficient for the computer to use.

computer program: A series of commands, instructions, or statements put together in a way that tells a computer to do a specific thing or series of things.

CP/M: Control Program for Microprocessors. One of the oldest and most popular *operating systems* for small computers, CP/M was introduced in 1975. Now an estimated 250,000 small computers use it. Thousands of specialized application programs have been written to be used with CP/M.

CPU: Central processing unit. The heart of a computer that controls all operations of all parts of the computer and does the actual calculations.

CRT: Cathode-ray tube. A TV-like display used with most small computers to show the information the computer has output.

cursor: A position indicator on a CRT. It's normally a flashing or nonflashing square or rectangle.

data: A general term meaning any and all information, facts, numbers, letters, symbols, etc., which can be acted on or produced by a computer.

database: A collection of related data that can be retrieved by a computer (such as a mailing list or list of accounts).

debug: To go through a program to remove mistakes.

disk: A round piece of magnetic-coated material used to store data with greater density, speed, and reliability than is available on cassettes (see **floppy disk**).

diskette: See **disk**.

display: A method of representing information in visible form. The most common displays used with popular computers are CRTs and printed paper.

documentation: (1) The instruction manual for a piece of hardware or software. (2) The process of gathering information while writing a computer program so that others using the program are able to see what was done.

execute: To carry out an instruction or series of instructions.

firmware: A term referring to software that has been permanently placed in memory—usually into a ROM (read-only memory).

floppy disk: A disk storage device made from a thin, circular piece of magnetic material. The usual disk sizes used with small computers are 5¼ inch and 8 inch.

flowchart: A common method of graphically planning what a piece of software should do before the actual writing process begins, or for describing what it does after it is written.

FORTRAN: FORmula TRANslation. A high-level computer language used primarily for mathematical computations. Although FORTRAN is available for some small computers, it is mainly used with large commercial systems.

garbage: Meaningless information.

graphics: Pictorial information in two dimensions.

handshaking: A preliminary exchange of information between a computer and an accessory (such as an acoustic coupler) which verifies that one has established communication with the other.

hard copy: A printout of information produced by the computer.

hardware: The physical part of the computer (such as the CRT, CPU, memory, etc.), as opposed to software.

hexadecimal: A number system with the base of 16. It is commonly used by programmers to indicate locations and contents of a computer's memory.

high-level language: A method of programming that allows a person to give instructions to a computer in a form using letters, symbols, or English-like text, rather than in the 1s and 0s code which the computer understands.

impact printer: A printer that produces hard copy by physically striking a ribbon and paper.

input: The transfer of data into the computer.

input/output: Called I/O for short, this is a general term for the equipment (such as modem or printer) connected to a computer and the two-way exchange of information that goes on between the computer and the peripheral.

instruction: A command to the computer telling it to do one specific thing.

integrated circuit: Also known as a chip, this is a group of interrelated circuits in a single package.

interactive: Describes a computer system where a two-way conversation goes on between the user and the computer.

interface: A piece of hardware or software used to connect two devices (computers and peripherals) that cannot be directly hooked together.

interpreter: A computer program which translates a single line of a high-level language at a time for the computer. Interpreters are more convenient but less efficient than compilers.

iteration: A series of steps in a program that is repeated until a condition is satisfied. (Also called a loop.)

line printer: A type of high-speed computer printer that prints an entire line at a time (instead of a character at a time).

load: To put data and/or programs into a computer.

location: A single specific place within computer memory where a piece of data is stored. A location is usually identified by a number (known as an address).

LSI: Large-scale integration. A single integrated circuit which has more than 100,000 circuits on it.

machine language: The "native language" of a computer; those fundamental instructions the machine is capable of recognizing and executing. The instructions are represented by binary code (1s and 0s).

memory: Circuitry and devices that hold the binary 1s and 0s the computer can access. Examples are main memory (integrated circuits), floppy disks, cassette tape, etc.

microprocessor: The central processing unit of a computer (usually in a single integrated circuit) that holds all the elements for manipulating data and performing arithmetic calculations.

MIS: Management information system. The use of a computer for providing information useful to managers (such as inventories, sales, accounts payable and receivable, etc.).

modem: Short for MOdulator/DEModulator. An electronic device that allows computer equipment to send and receive information through telephone lines. There are two major types: direct-connect modems and acoustic couplers. Direct-connect modems usually plug directly into a telephone wall jack; acoustic couplers use the telephone handset for sending and receiving information.

MTBF: Mean time between failures. The average time between failures of any particular device.

network: An interconnected system of computers and/or terminals. The components do not have to be physically close to one another and are often connected by telephone lines.

node: A station on a network. A node can be a computer or terminal.

operating system: "Traffic cop" software that oversees the overall operation of a computer system.

Pascal: A high-level programming language named after the seventeenth-century French mathematician Blaise Pascal.

peripherals: Equipment (usually hardware) that is external to the computer itself. The most common peripherals used with popular computers are disk drives, printers, and cassette-tape recorders.

printer: An output device that produces hard copy.

printout: Hard copy produced by a printer.

program: (1) A set of instructions that tells a computer to do something. (2) To prepare the set of instructions.

RAM: Random-access memory. The main type of memory used in a small computer. The time required for the computer to find one piece of information in RAM is essentially the same no matter where the information is stored. Also known as read/write memory because data in RAM can be easily changed.

ROM: Read-only memory. Memory where information is permanently stored and cannot be altered. This form of memory is also random-access.

RS-232C: A technical specification published by the Electronic Industries Association which specifies one way in which a computer communicates with a peripheral (such as a modem or terminal).

service contract: A repair contract. Computer failure insurance.

software: Programs or segments of programs. The term was coined to contrast with hardware—the actual mechanics and circuitry of a computer.

software house: A company that writes programs or customizes programs specifically to the needs of an individual customer.

system: An organized collection of hardware and software that works together.

system software: General-purpose programs that allow programmers to write or modify applications programs. BASIC may be considered part of the system software; so is the computer's operating system.

telecommunication: Transmission of data between a computer and another computer or terminal in a different location. It can be done with phone lines, satellites, radio waves, optical fibers, or other means.

terminal: A piece of equipment with a keyboard for input and an output device such as a CRT or printer. A terminal is used to communicate with the computer.

timesharing: A process whereby the facilities of a single (usually large) computer are shared by a number of users. Timesharing requires large amounts of memory and special software to make it appear that each user has the whole computer to himself.

track: A section of a disk or tape.

turnkey system: A computer system in which all the hardware and software has been installed. Theoretically, all you have to do is turn it on.

volatile memory: Hardware which requires continuous electrical power to keep from losing information. Most RAM is volatile; ROM is not.

word: A group of characters or data that occupies one location in the computer's memory.

word processing: The entry, manipulation, editing, and storage of text using a computer.

Coming Up

IBM's Personal Computer—An in-depth look at this revolutionary new product from *the* industry giant. Is it for you?

Silicon Valley Profile—This 50-mile strip south of San Francisco has become the hub of the small-computer industry. We'll look at how the "California experience" has shaped the area.

An Apple in the Newsroom—How a Washington correspondent uses an Apple to understand the federal budget and scoop the competition.

Computer Camps—Summer camps that teach kids about computers are springing up all over the country. Should you send your children to one?

Software Piracy and Protection—A thorough study of the thorny technical, legal, and economic issues involved in preventing software "rip-offs."

Classroom Computers—For all the disorder, upheaval, and controversy they have generated, computers that teach are here to stay.

How to Use Advanced BASIC Features—Our guide to BASIC programming continues.

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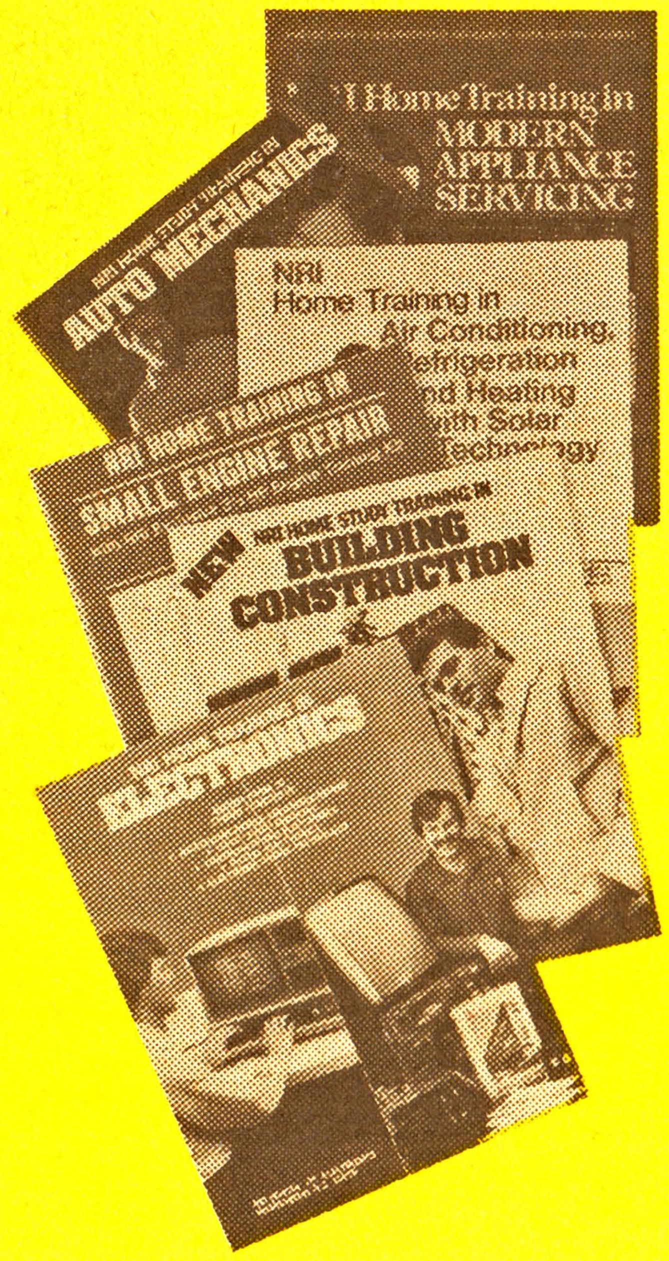

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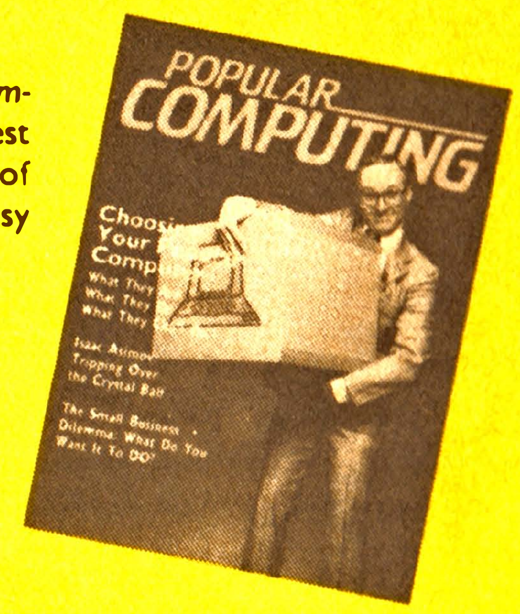

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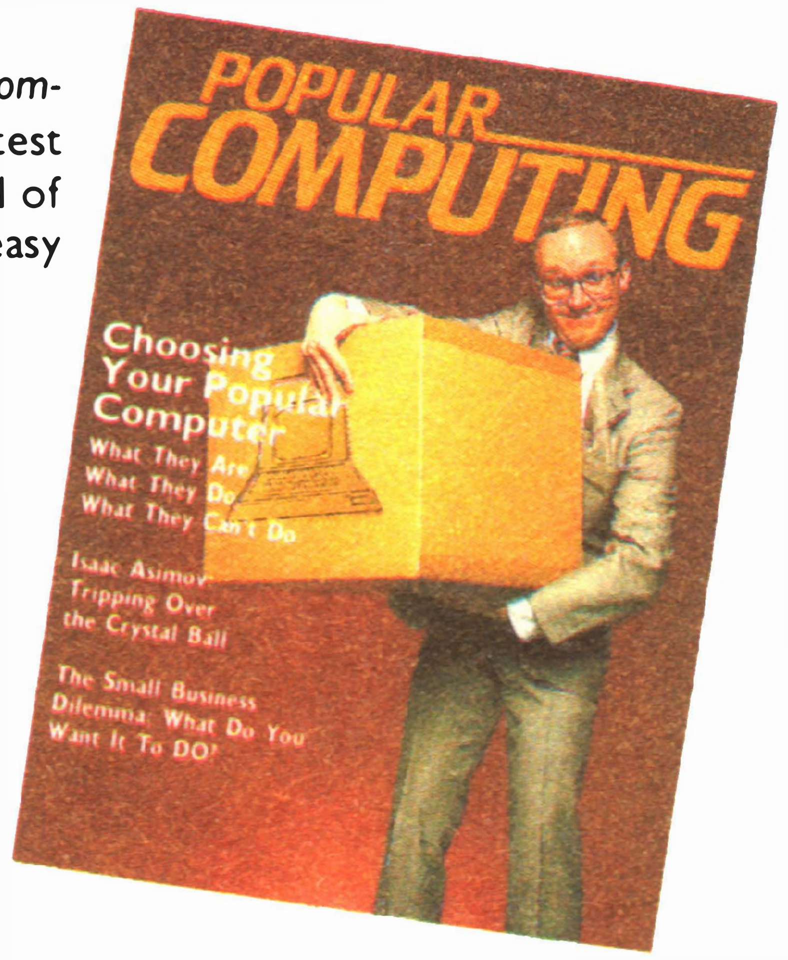

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14	34	54	74	94	114	134	154	174	194	214	234	254	274	294
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298
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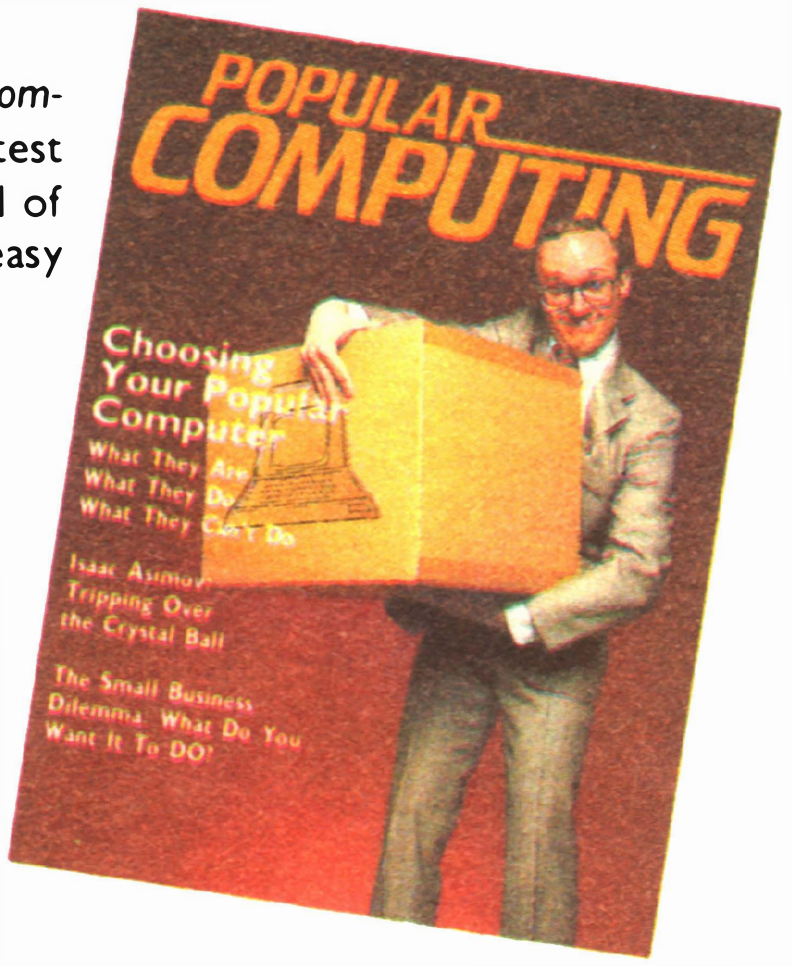

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